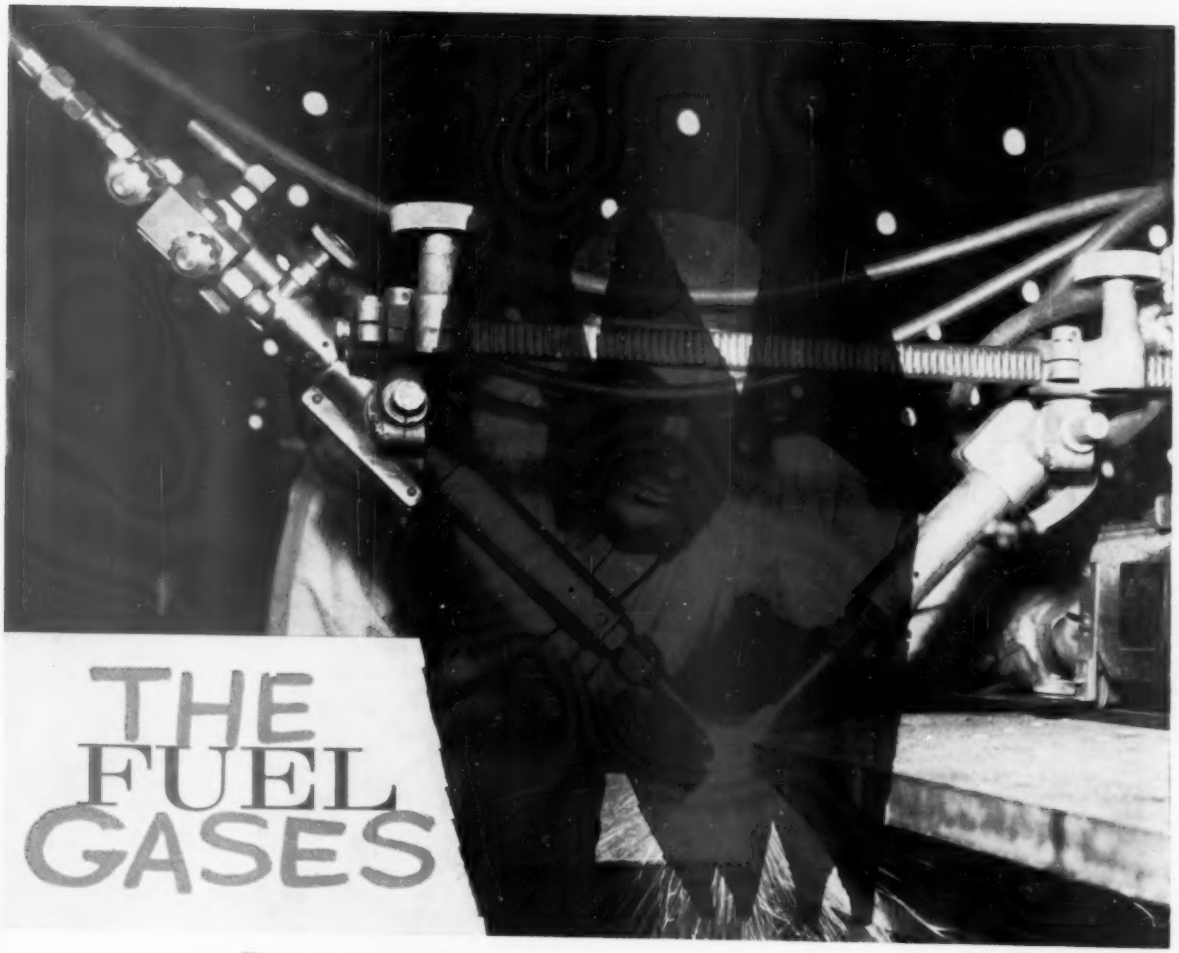
DECEMBER, 1961
50 Cents

Welding Engineer



THE FUEL GASES

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BRAZING ALLOY REFERENCE CHART

SILVALOY BRAZING ALLOYS

SILVALOY	NOMINAL COMPOSITIONS					Solidus °F	Liquidus °F	Density troy oz /cu in
	Ag	Cu	Zn	Cd	Other			
5	5	88.75	0	0	P=6.25	1190	1300	4.37
15	15	80	0	0	P=5	1190	1300	4.45
35	35	26	21	18		1125	1295	4.90
45	45	15	16	24		1125	1145	4.92
50	50	15.5	16.5	18		1160	1175	5.00
503	50	15.5	15.5	16	Ni=3	1170	1270	5.00
355	56	22	17	0	Sn=5	1145	1205	5.00
I-401	5	0	16.6	78.4		480	600	4.53
377	5	0	0	95		640	740	4.60
A-4	9	53	38	0		1410	1565	4.50
20	20	45	30	5		1140	1500	4.64
A-11	20	45	35	0		1315	1500	4.68
A-79	25	52.5	22.5	0		1250	1575	4.71
A-13	30	38	32	0		1370	1410	4.67
250	40	30	28	0	Ni=2	1220	1435	4.76
254	40	30	25	0	Ni=5	1220	1580	4.72
A-14	40	36	24	0		1235	1415	4.80
105	45	30	12	0	Mn=13	1298	1298	4.76
A-18	45	30	25	0		1225	1370	4.82
A-25	50	34	16	0		1250	1425	4.99
54	54	40	5	0	Ni=1	1340	1575	5.06
A-33	60	25	15	0		1245	1325	5.02
60	60	30	0	0	Sn=10	1115	1325	5.23
T-50	62.5	32.5	0	0	Ni=5	1435	1590	5.19
Easy	65	20	15	0		1240	1325	5.06
Medium	70	20	10	0		1275	1360	5.14
301	72	28	0	0		1435	1435	5.24
AE-102	72	27.8	0	0	Li=.2	1410	1410	5.22
K-427	75	0	25	0		1300	1345	5.06
T-51	75	24.5	0	0	Ni=.5	1435	1475	5.30
Hard	75	22	3	0		1365	1450	5.28
T-52	77	21	0	0	Ni=2	1435	1525	5.32
A-49	80	16	4	0		1345	1490	5.29
AE-100	92.8	7.0	0	0	Li=0.2	1410	1610	5.46
S-475	95	0	0	0	Al=5	1550	1600	5.73
AT-601	97	0	0	0	Li=3	1115	1235	3.54
AT-600	98	0	0	0	Li=2	1290	1400	4.03

SILVALOY & PRECIOUS METAL ALLOYS

The American Platinum & Silver Division is ready to supply your brazing needs. The alloys listed here are part of the AP&S service. Refer your brazing problems to us for our recommendations, or write to American Platinum & Silver Division directly, or to your local Silvaloy distributor.

Silvaloy compositions include all commercially important silver base alloys and many special purpose compositions. The popular low temperature Silvaloy 35, Silvaloy 45, Silvaloy 15 are included in this group. If other compositions are required they can be supplied on special request.

We Recommend #1200 or Black Flux with Silvaloy Brazing Alloys

Ask for "A Complete Guide to Successful Silver Brazing...."

PRECIOUS METAL BRAZING ALLOYS

ENGALOY PM	NOMINAL COMPOSITIONS					Solidus °F	Liquidus °F	Density troy oz /cu in
	Au	Pd	Ag	Cu	Other			
478		5	68	27		1480	1490	5.31
491		10	58	32		1520	1565	5.30
490		15	65	20		1565	1650	5.45
493		20	52	28		1615	1650	5.41
492		25	54	21		1650	1740	5.51
428		5	95			1780	1850	5.56
431		10	90			1835	1950	5.60
447		20	80			1960	2150	5.67
485		30	70			2120	2250	5.74
238	80			20		1630	1630	8.28
261	75		5	20		1625	1640	7.99
265	72				(Ni=22) (Cr=6)	1785	1835	7.48
242	37.5			62.5		1814	1859	5.90
260	35			65		1832	1870	5.80
243	35			62	Ni=3	1787	1886	5.81
255	82				Ni=18	1742	1742	8.41
129		60			Ni=40	2260	2260	5.58
440		20	75		Mn=5	1830	2050	5.56
441		33	64		Mn=3	2100	2190	5.70

Precious metal compositions provide higher brazing temperatures as may be required for vacuum tube, aircraft, or missile use. These alloys will provide good corrosion resistance and minimum diffusion into base metals. They are ideal for atmosphere brazing.

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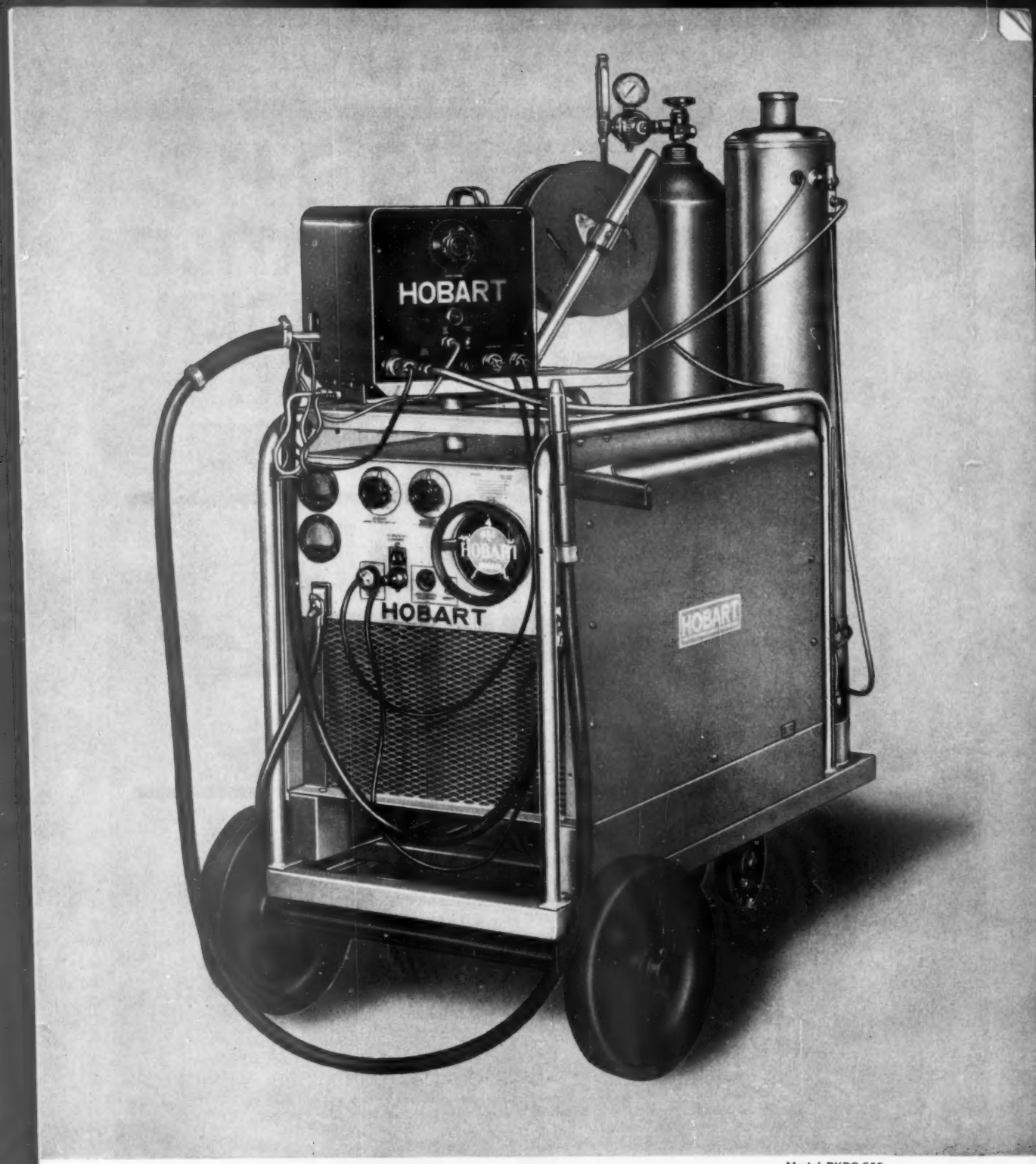

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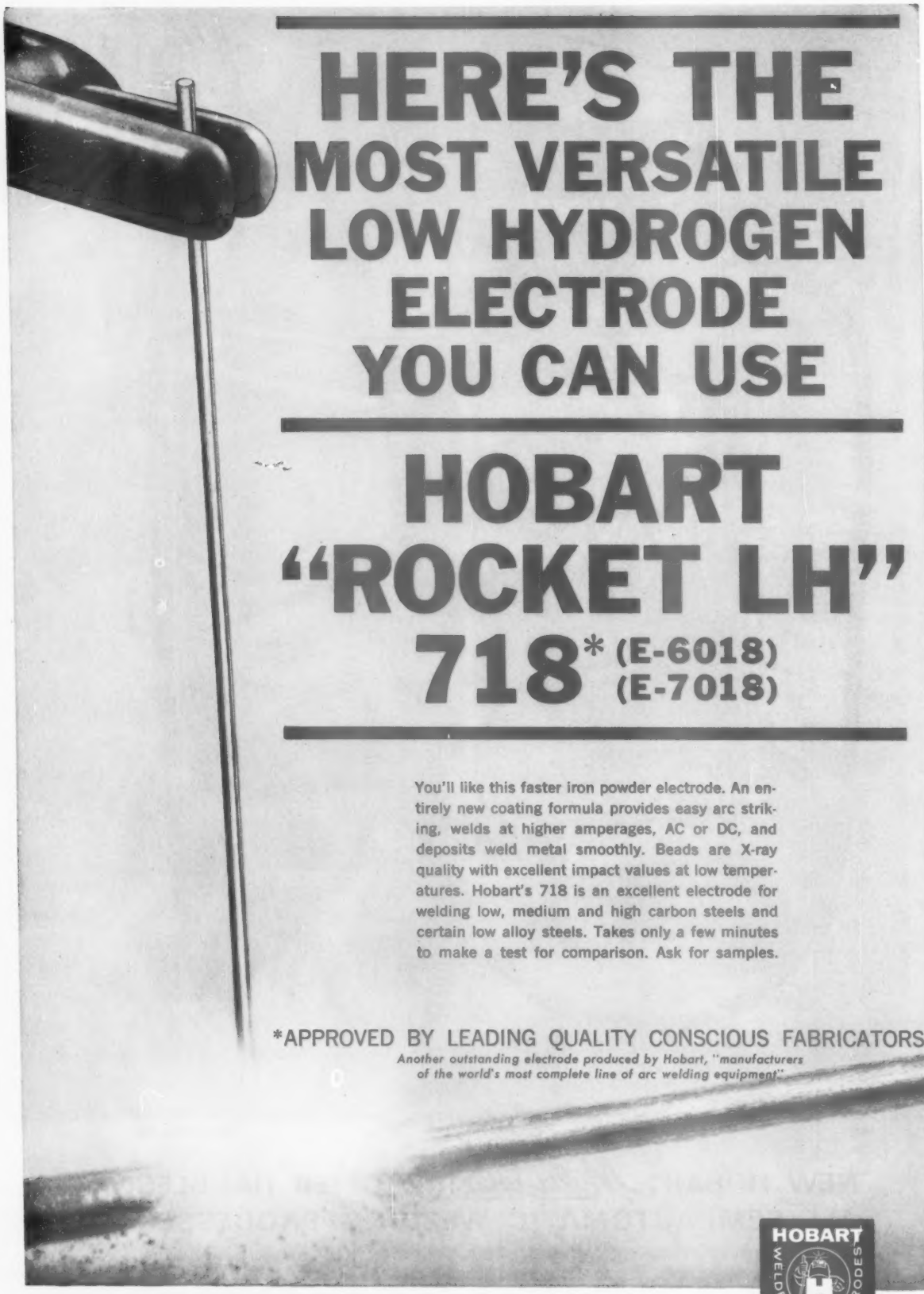
NEW HOBART *Multi-wire* RECTIFIER HANDLES ALL SEMI-AUTOMATIC WELDING PROCESSES

. . . Years ahead in concept and design, the Multi-Wire Rectifier offers exceptional cost cutting advantages in one complete package. It feeds wire automatically to weld carbon steel, stainless, aluminum and many other non-ferrous alloys. Easily interchangeable components permit the use of these six different processes: Micro-Wire, MIG-CO_2, FABCO, MIG-ARGON, SUBMERGED ARC, OPEN ARC. Ask for complete details.

Hobart Brothers Company, Box U-121, Troy, Ohio

For more facts Circle No. 151 on Welding Info-Aid Card



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*APPROVED BY LEADING QUALITY CONSCIOUS FABRICATORS

Another outstanding electrode produced by Hobart, "manufacturers of the world's most complete line of arc welding equipment"

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HOBART BROTHERS CO., BOX U-1211 Troy, Ohio, Ph. FE 2-1223

This is welding: December, 1961

Welding Engineer

The magazine of joining and severing of materials

Cover photo . . . twin torches bevel edge on 1¼ in. plate using oxy-natural gas. Courtesy Canadian Oxygen, Ltd.

The fuel gases: how to evaluate them 37

There are many factors governing the choice of the most economical and efficient fuel gas for your oxygen-cutting operations. Whether you are satisfied with your present preheat fuel, or if you are thinking of a substitute, read what author **Harris A. Goodwin** has to say about the major fuel gases in use today.

Russian welding: progress and goals 48

Advanced welding methods will gain time in the economic competition with capitalism: so states one of the Soviet welding magazines. This special report describes the advances, as well as the failures, and separates fact from propaganda in the Russian welding program.

Thin-skin welds used to complete solar mirror 58

Capturing energy from the sun is an age-old quest. The latest entry in the field is a 10-ft-diameter, resistance spot-welded mirror fabricated by a west coast firm. This prototype may be the solution to powering U. S. space vehicles.

Your 1961 editorial index 84

Trying to remember in which issue of WELDING ENGINEER an article appeared? Here is a complete list of articles published this past year, including a list of the authors. Original titles have been boldfaced for your convenience; cross references are in lightface.

Also in this issue:

Tig welded pipe curbs high liquid fuel waste 46

Welding well represented at Detroit Metal Show 55

Modernized electrode plant draws wire at 1,200 fpm 62

One man makes 10,000 stud welds in a week 67

800 specialists speak at safety congress 69

VOL. 46—No. 12

Regular **WE** features . . .

December Headlines 7
Dateline: Washington 11
Letters 12
Between passes 15
Your WeldWorld at press time 17
New products for you 18
Editorial: Return to individualism 35
Data Sheet No. 256 —
Fuel gas cylinder data 45
In summary 72
VIPs in review 73
Book reviews 79
In retrospect 81
The Welding Shopper 83
Literature for your library 88
Welding Info-Aid Card 89
Advertisers' literature 89
Advertisers in this issue 90

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Why pay a premium for more valve than you need? RegO engineers developed the remarkable new compact 600 series "O" ring cylinder valve for maximum efficiency coupled with minimum weight, and cost-cutting economy.

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Convenient positive-action handwheel operation does away with bulky, easy-to-misplace valve wrenches. Choice of Umbrella-type handwheel (can't collect water) or standard flat disc-type handle. Adequate clearances prevent "knuckle-busting"; precision machined for smooth one-hand operation.

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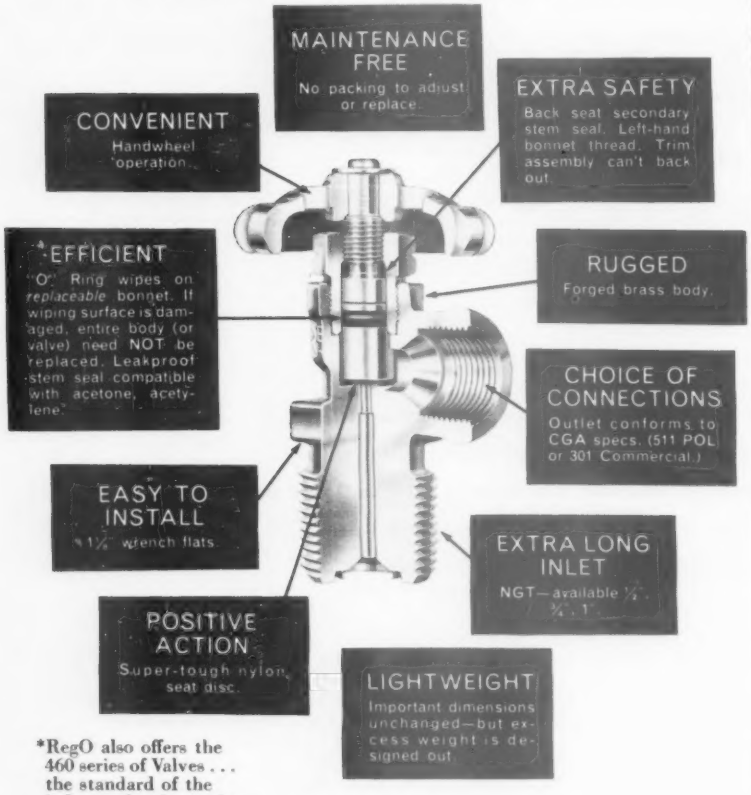
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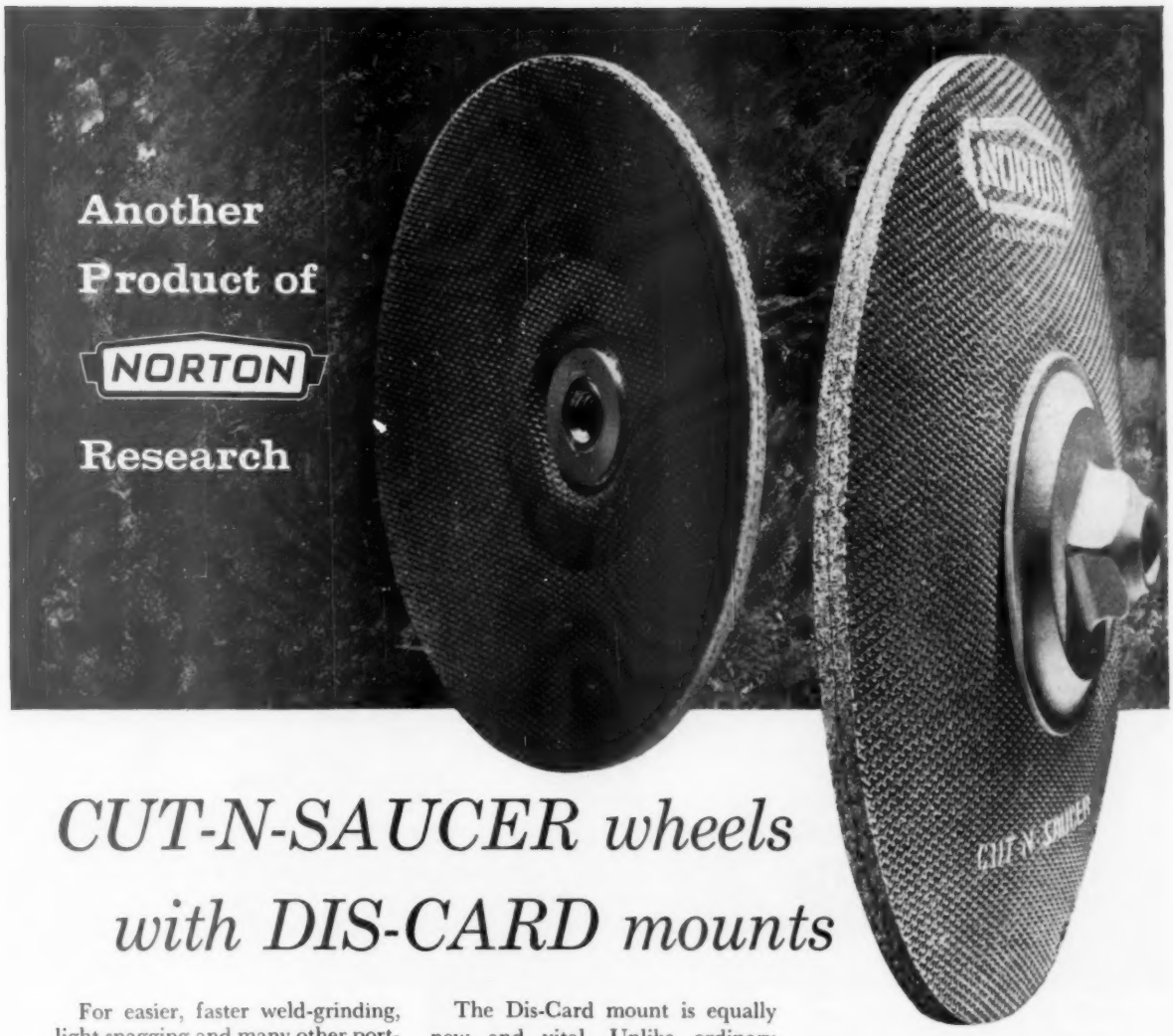

CUT-N-SAUCER wheels with DIS-CARD mounts

For easier, faster weld-grinding, light snagging and many other portable grinding jobs, Norton offers you:

Reinforced wheels that combine a saucer shape with a disposable mount.

These are the new BSA Type Cut-N-Saucer wheels with Dis-Card mounts . . . available in 7" and 9" diameters. They are produced in the big new Norton Plant 8, built specifically to improve the manufacture and performance of resinoid wheels.

Reinforced with layers of fibre glass, BSA Cut-N-Saucer wheels gain added advantages from the new shape. Compared with straight wheels, Norton BSA wheels on the job can be held at angles much closer to the horizontal. Results are easier control and reduced operator fatigue.

The Dis-Card mount is equally new and vital. Unlike ordinary mounts it is no separate attachment. It is permanently secured — designed to be bought and thrown away with every wheel. This means you can change wheels in seconds — completely eliminating "lock washer" action and the usual mounting routine that can take up to half an hour. So every Cut-N-Saucer wheel you buy is already mounted — and *stays* mounted, throughout wheel life.

Yet you pay no more for a Norton Cut-N-Saucer than for a conventional reinforced wheel!

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Also Available — a complete line of cups, cones and straight wheels in the 44 ALUNDUM abrasive and B11 resinoid bond combination that assures fast cutting action with long wheel life.

W-2023A

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The most flexible, useful tools in the metalworking industry

For cutting, welding, melting, brazing, hardfacing, heating, heat treating, heat priming and descaling, The Journeyman Unit provides a complete outfit of VICTOR quality, standard industrial-type equipment, including:

Regulators... SR400 series single stage safety type
Welding Torch... Model 315 (9" long)
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Cutting Tip... Type 3-101, size 1* (cuts to 1")
Accessories... 25 ft. ¼" dual hose, goggles, spark lighter, wrench and instruction book (Form 1)

*Additional types and sizes can be added as needed to extend the work range of the unit.

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VICTOR for welding and cutting

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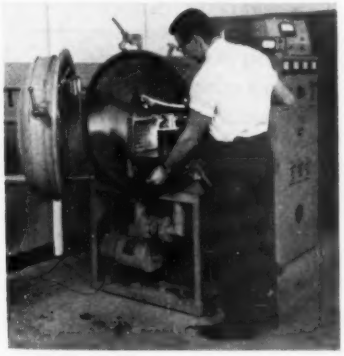
Manufacturers of welding and cutting equipment; high pressure and large volume gas regulators; hardfacing rods; blasting nozzles; cobalt and tungsten castings; straight-line and shape cutting machines; roller and idler rebuilding machines.

December Headlines

NEW research and technical center of Anaconda American Brass Co. (above) contains Tig welder for tube-to-tube sheet seams (below, left) and experimental vacuum melting and casting facilities (below, right).



Anaconda opens $1 1/2 million research and technical center

A new $1,500,000 research and technical center has been built in Waterbury, Conn., by Anaconda American Brass Co.

The 50,000-sq-ft building contains metallurgical, corrosion and chemical laboratories and pilot plant facilities.

The completely air-conditioned building also contains a scientific library, an auditorium and projection facilities. Approximately 100 persons are now employed in the center and additional staff members will be added.

In an open house to announce the research facilities, Gilbert C. Strubell, adminstrative director of metallurgy and research, said:

"We will be concerned with the properties of copper and its alloys which make them unique. These are conductivity, corrosion resistance, strength, ease of working, ease of joining."

One of the research projects at the laboratory will be a study to determine the vacuum melting effects on copper and copper alloys.

SNT is seeking papers on uniform weld quality

The Society for Nondestructive Testing is seeking papers for presentation at their annual meeting which will be held in conjunction with the annual American Welding Society meeting in April.

"Assurance of uniform weld quality" will be the theme of the meeting which will be held in Cleveland on April 16-20, 1962.

All authors who are interested in presenting a paper at this meeting should submit an abstract by December 29, 1961, and a full paper by January 15, 1962.

Interested authors should submit abstracts to: Edwin M. Miller, Griscom-Russell Co., Massillon, Ohio.

Linde Co. appoints distributor council

Linde Co., New York City, has appointed nine welding supply distributors to serve on its 1962 Distributor Advisory Council.

The distributor representatives are: Charles W. Berry, General Welding Supply Corp., Westbury, N.Y.; Arthur K. Cottet, Cottet's Welding Supply Co., Inc., Syracuse, N.Y.; Ralph G. Floreth, Ill-Mo Welding Products Co., Inc., Jacksonville, Ill.; H. Grady Lester, Jr., General Welding Supply Co., Tampa; Everett P. Lutz, Anderson Equipment Co., Los Angeles; William W. McGinnis Welding Supply Co., Wichita Falls, Tex.; M. M. Powar, Welding & Cutting Supply Co., Cleveland; Robert Toll, H. R. Toll Co., Minneapolis; and Conrad Zimmerman, Industrial Welding Supplies, Inc., Charleston, S.C.

Westing-Arc Dept. holds annual sales meeting

A stepped-up merchandising program, two new products, and a look at the future for welding equipment sales were features of the recent annual sales meeting of Westing-Arc Dept., Westinghouse Electric Corp., Buffalo, N.Y.

Representatives from the field sales organization across the nation attended.

COMING EVENTS

DEC. 4-6: Winter Meeting, Independent Oxygen Manufacturers Association, Alffor Hotel, Mexico City.

JAN. 22-25, 1962: National Plant Engineering & Maintenance Show, Convention Hall, Philadelphia.

JAN. 29-Feb. 2, 1962: Winter General Meeting, American Institute of Electrical Engineers, New York Coliseum, New York City.

FEB. 27-MAR. 1, 1962: 3rd Annual Symposium on Nondestructive Testing of Aircraft and Missile Components, Gunter Hotel, San Antonio, Tex.

APR. 9-13, 1962: 43rd Annual Convention, AWS, Sheraton Cleveland Hotel, Cleveland.

APR. 9-13, 1962: ASME Metals Engineering Conference, Sheraton Cleveland Hotel, Cleveland.

APR. 10-12, 1962: AWS Annual Welding Exposition, Cleveland Public Auditorium, Cleveland.

APR. 16-18, 1962: Spring Meeting, Abrasive Grain Association, Conrad Hilton Hotel, Chicago.

APR. 25-29, 1962: Western Space Age Industries and Engineering Exposition and Conference, Cow Palace, San Francisco.

New Handy & Harman plants

NEW Handy & Harman plants in Mount Vernon, N.Y. (above) and Providence, R.I. (below) are now in operation. The Mount Vernon plant at 525 Nuber Ave. replaces the firm's New York City plant at 82 Fulton St. The new Providence plant is at 845 Waterman Ave. Handy & Harman's general offices remain at 850 Third Ave., New York 22, N.Y.

York, Chicago Welding give welding scholarship

York Engineering and Chicago Welding Sales Co., Chicago, have presented their 1961-1962 scholarship award for welding engineering to Patrick R. Scott, a third year welding engineering student at Ohio State University.

Scott

Scott chose to study welding because of its versatility and has reported that "after becoming more acquainted with the field, I tend to feel that my somewhat haphazard choice was one of the wisest I have ever made."

Welding institute held for high school teachers

A welding institute for high school teachers was held recently at the University of Wisconsin, Madison, Wis.

Held in cooperation with the Madison-Beloit Chapter of the American Welding Society, speakers at the institute included T. B. Jefferson, publisher of WELDING ENGINEER; Howard E. Adkins, engineering consultant with Kaiser Aluminum & Chemical Sales, Inc.; and Howard B. Cary, director of Hobart Bros. Technical School.

Birdsell moves plant to Monrovia, Calif.

Birdsell Products, Pasadena,, Calif., has moved its manufacturing plant from Palo Alto to Monrovia, Calif.

Executive offices remain at 350 N. Halstead, Pasadena.

Linde to expand Tonawanda laboratory

Linde Co., New York City, will expand its Tonawanda, N.Y., laboratory to include a $215,000 two-floor addition.

The addition will provide laboratories and offices for 30 scientists. Last August, Linde began another $2.5 million factory laboratory expansion.

(More news on page 70)

Jackson Products holds open house

PLANT tour (left) during open house at Jackson Products new plant at Warren, Mich., includes demonstration of cable sockets drilled in an electrode holder tong. At the open house were (right, left to right) R. E. Lenhard, president of Air Reduction Sales Co.; A. C. Gilbert, general manager of Jackson; and C. H. Glasier, executive vice-president of Airco.

Electrode Holder Selector Chart

Holder Class	Recommended Maximum Amperage	Maximum Rod Size	Recommended Maximum Cable Size	Replaceable Jaw Feature	Weight	Duty Cycle* Rating	Jackson Holder Model
SMALL	200	5/32"	No. 1	no	12 oz.	50%	JH-1
	200	5/32"	1/0	yes	9½ oz.	45%	JH-2
MEDIUM	300	7/32"	2/0	no	19 oz.	50%	AW-C
	300	¼"	2/0	yes	14 oz.	45%	A-W
	300	¼"	2/0	yes	15¾ oz.	45%	JH-3
	300	¼"	2/0	no	17 oz.	50%	B-1
	350	¼"	2/0	no	22 oz.	50%	A-1
	350	¼"	2/0	no	23 oz.	50%	ST-3
LARGE	400	5/16"	3/0	yes	21 oz.	50%	A-5S
	400	7/32"	3/0	no	19 oz.	65%	B-4
	450	3/8"	3/0	no	24½ oz.	65%	B-3
	450	3/8"	3/0	no	29 oz.	65%	A-3
	450	3/8"	4/0	no	28 oz.	65%	ST-5
EXTRA LARGE	500	3/8"	4/0	no	32 oz.	80%	A-3S
	500	3/8"	4/0	yes	32 oz.	80%	AA-3S

*The Duty Cycle Rating is the maximum percentage of actual arc-time (out of any 10-minute period) that a holder should be expected to perform comfortably.

Here are the *facts* that will get you the best buys in electrode holders. Go into the table with your requirements, come out with the best possible holder selection for *your* needs. The maximum amperages and duty cycle ratings we show are honest, conservative figures. Trust them. The replaceable jaw feature, offered in five Jackson models, pays worthwhile dividends in longer holder life. Tear out the chart. Use it.

Featherlight

Tongs are of aluminum alloy with replaceable jaws of copper alloy. All-purpose holders that are easy to use, cut fatigue.

Streamlined

These are of Featherlight construction, with compact, low-profile design. The most fully insulated Jackson holders.

Sealed Tight

The 98% copper alloy holders with a cable connection that's made mechanically but conducts current as though fused.

Economy

These semi-insulated copper alloy holders have exposed tongs. For production line service at lowest possible cost.

High Production

High duty cycle ratings, replaceable part design, and heat resistant insulation qualify these copper alloy holders for high production use. You'll find one in every size class.

Sold Everywhere by Better Welding Supply Distributors

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

5523 Nine Mile Road, Warren, Michigan

It's easy on the welder
It's flexible . . it's tough

Yes, Belden Welding Cable is "easy on the welder." It's engineered and manufactured to be extremely pliable, limp and flexible. Result: more production . . better quality . . lower costs.

And Belden Welding Cable is rugged . . rough and ready for the most severe conditions of abrasion, impact, as well as exposure to heat, cold, and oil.

Belden has a welding cable engineered for every possible welding requirement . . Oil Tempered Rubber Jacketed . . Neoprene Jacketed . . HVF Vinyl Plastic Jacketed . . Whip Lead, Super-flexible and Neoprene Jacketed . . Neocote colors for identification . . Rubber Jacketed Welder Supply Cords.

ORDER FROM YOUR WELDING SUPPLY DISTRIBUTOR

Belden Welding Cable comes in many ready-to-use package lengths.

Welding Cable by Belden

WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

one wire source for everything electrical and electronic

magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • control cables • automotive replacement wire and cable • aircraft wire

18-1-0

dateline: WASHINGTON

A recent buying spree by U. S. investors sent the stock market soaring. Main reasons behind the upsurge: brisk auto sales (as well as substantial increases in clothing and general merchandise sales), the somewhat less tense Berlin situation, and an expected increase in government spending.

Federal expenditures are rapidly becoming the touchstone of the national economy. From 1955 to 1960 federal buying jumped from $75.6 billion to $100.1 billion – about half of which usually goes for defense. In the current fiscal year military contracts alone already total $25.5 billion

* * *

And the end to the defense spending road is not in sight. President Kennedy, in a recent belt-tightening speech to cabinet members and government agency heads, made 1963 the target year for a balanced budget, "barring extraordinary and unforeseen defense requirements. It is already clear that expenditures for the military and other elements of our national security programs will necessarily rise next year."

A good indication of the "unforeseen" requirement: a new missile program which was recently announced. The Defense Department says there is a need for a medium range ballistic missile (MRBM) for both land and sea operations. Studies are underway and development is about to start. The proposed missile program may be substituted for that of the Minuteman missile, which Defense Secretary Robert McNamara has cut-back.

* * *

A few economists feel that the President's near-balanced budget may depress the national economy. AFL-CIO economists agree; they see a possible slump in 1963. Basing their prediction on past recovery patterns, the union economists stated: "It will run out of steam 12 to 15 months after the upturn started." But they did predict a continued rise of the economy into mid-1962.

From the other side of the fence, Budget Director David Bell denies the recovery will be slowed because of budget balancing. Reason: a continuing policy of relative monetary ease by the Federal Reserve Board – plus the inevitable increased defense spending.

Those economists who agree with Bell, hedge their agreement by pointing out that there still won't be full employment next year. Unemployment still hovers stubbornly at 6.8% where it has been for the past 11 months. Labor Secretary Goldberg, who has been predicting an unemployment decrease for some time, recently predicted again that the rate would drop for November – this time on the basis of new statistics and an analysis of October employment.

* * *

Depreciation for machinery should be based on technological obsolescence, not on physical life. This has been the machine tool industry's argument for years. And it looks as if the Kennedy administration has bought much of it.

The White House has decided to give faster write-offs to the textile industry and has committed itself to doing the same for other industries. Revision of Bulletin F (the government's tax life schedule) has already begun. Textile firms can now write-off equipment with a schedule tax life of 25-40 years in just 15 years; equipment with a tax life of 15-20 years, in 12 years.

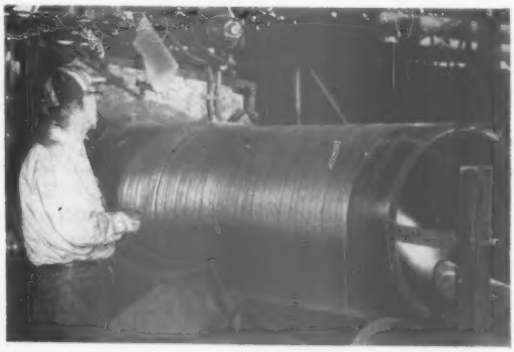
Growth industries will benefit most since their equipment obsolescense is more rapid – but look for similar write-off changes for all industries.

HOW TO MAKE A RAM REALLY TOUGH

They have the answer at **Cameron Iron Works** in Houston.

A 3/16 in. layer of Coast Alloy No. 80A, deposited by submerged arc welding, gives steam press rams a hard, tough surface that battles thermal shock and high pressure to a standstill—wears longer—cuts operating costs.

No. 80A is one of more than fifty Coast Metals hard facing alloys each designed to meet specific requirements for resistance to abrasion, impact, heat and corrosion. Write when you've a problem along these lines.



Coast Metals, Inc., Little Ferry, N.J.
ALLOYS for HARD FACING and BRAZING • CASTINGS

Letters

Safety issue

My field of teaching is the area of industrial safety engineering and plant fire protection. Our professor of welding engineering called my attention to the safety and health articles in your October issue of WELDING ENGINEER. I would like to compliment your editors on an outstanding job — the material is excellently written and very informative.

George W. Harper
Professor of
Mechanical Engineering
University of Illinois
Urbana, Illinois

Fiber metallurgy

We refer to the article on fiber metallurgy which appeared on page 27 in the March 1961 issue of WELDING ENGINEER.

Several of our member firms are interested in this development and we should be grateful if you would inform us if this fiber metal sheet is commercially available in the United States, and if so, details of suppliers.

V. C. Watts
Production Engineering
Research Association of
Great Britain
Leicestershire, England

— Fiber metal resistance welding and fiber metal shim brazing . . . are still in the development stage. There is no commercial source for the fiber metal shims which are necessary in these processes. These shims are available in our laboratory, and can be made for development studies without too much difficulty. We hope that this material will become available in the near future. This depends to a large extent on the need which can be projected . . . John F. Rudy, Armour Research Foundation.

Instructor's opinion

I am receiving WELDING ENGINEER through the Philip Schuyler High School. As an in-

structor, I couldn't get along very well without it. The new methods and materials are a requisite to our business.

Robert Critcher
Albany, N. Y.

Electroslag welding

The Materials Laboratory of Detroit Arsenal is interested in the possible application of electroslag welding. Any information you may be able to supply regarding this process will be appreciated.

The following information is of particular interest:

1 — Literature covering the process.

2 — Users of the process.

3 — Other sources of information.

R. H. Dunec
Chief, Materials Laboratory U.S. Army Ordinance Arsenal, Detroit

— We are forwarding to you tear sheets of several articles published recently in WELDING ENGINEER *on electroslag welding. To the best of our knowledge, only three firms in the United States have as yet purchased an electroslag welding machine. Most of the users are in Europe.*

For further information, regarding the processes and users, we suggest you get in touch with Mr. James Norcross, Arcos Crop., 1500 S. 50th St., Philadelphia 43, Pa. Arcos is the distributor for electroslag welding equipment in the United States. Incidentally, the firm has a 20 minute film showing the use of electroslag welding in the Soviet Union. — Ed.

Welding applied

Please renew my subscription to WELDING ENGINEER. In spite of a number of years' absence as a subscriber to your publication, I have had a continued interest in WE and the stories and information it contains.

I think of welding for its many uses and permanence of application in everything from art to buildings and, in the near future, I am hoping to use welding in the building of new homes and remodeling of old homes for I feel welding and steel will enable us to house all Americans in the homes we need.

Robert Jones
Seattle, Wash.

connect or splice
welding cable
in seconds
with just a hammer
. . . and a
Bernard Connector!
Pats. Pend.
1 Strip cable
2 Insert cable.
3 Drive down Malleable Punch with hammer.
BERNARD Cable
Lugs and Splicers are:
FAST A few hammer blows form a perfect connection!
BEST Greater pull-out strength! Higher electrical conductance!
LOW COST Sensibly priced . . . saves time . . . no special tools needed!
AVAILABLE Lugs and splicers covering a full range of cable sizes, from stock!
PIONEER FOR
BERNARD
MODERN WELDING
Ask for Connector Bulletin No. 102 for full description, sizes and prices!
"Shortstub" electrode holders
"BERNARD" hammer-on cable connectors
"MULTI-PIC" slag chipping hammers
"LC" high current welding apparatus
"BERNARD" welding equipment coolers
BERNARD WELDING EQUIPMENT CO.
10232 Avenue N, Dept. WE, Chicago 17, Illinois

For more facts Circle No. 158 on Welding Info-Aid Card

LINDE ELECTRIC WELDING

PLASMARC

New...very-thin, fused deposits with controlled dilution
New...high-speed, dross-free cuts in 5-in. thick metals

LINDE, inventor of plasma arc processes, announces *new* PLASMARC weld surfacing and *advanced* PLASMARC cutting. What is plasma arc? It is a flow of gas forced through an electric arc, constricted in a small-bore torch nozzle, and accelerated to form an intense jet. It combines electrical heat with the latent heat of highly-excited ionized gas atoms to reach one of the highest known metal-working temperatures (30,000° F.). It will melt any known metal.

A TRUE WELD

PLASMARC *weld surfacing* is true welding—not coating or plating—achieved by feeding powdered metal through the plasma arc into a weld puddle which freezes to form the deposit. Its precision eliminates excess buildup—ideal for such parts as valves, plowshares, seals . . .

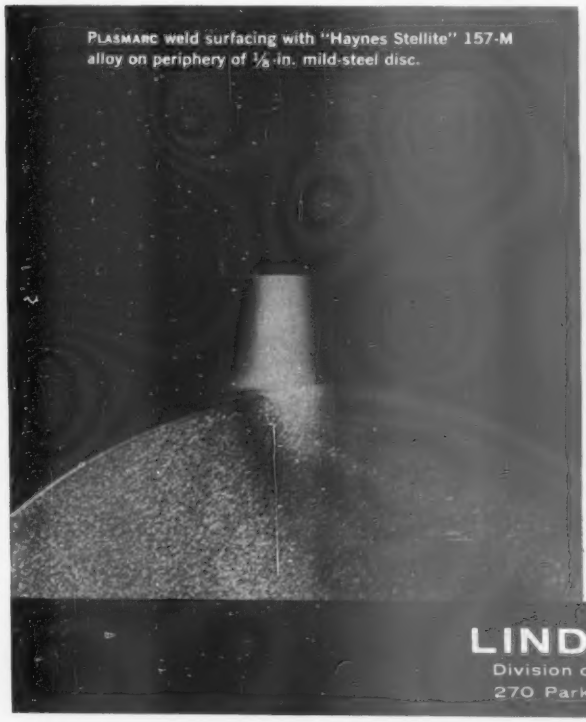
PLASMARC weld surfacing gives precise control of penetration of overlay metal into base metal—as little as .005 in. or higher. Gives precise control of dilution with base metal—from 5% up to 50%. Provides one-pass deposits as thin as .010 in., as thick as 3/16 in., with a wide range of metals and alloys. Produces widths from ⅛ in. to 1 in. or more, speeds over 20 ipm at 95% deposition efficiency, flatter and smoother deposits than other fusion processes.

4000 FT./SEC. VELOCITY

PLASMARC *cutting* uses a near-sonic velocity plasma jet (4000 ft./sec.). It easily melts-and-forces a narrow kerf through both ferrous and non-ferrous metals with little or no change in metallurgical properties. After six years' success, it is replacing shearing, sawing and powder cutting—slower methods which often require machining of the cut edge.

PLASMARC cutting has been further developed—heavy-duty equipment, higher current capacity—to handle increased metal thicknesses. It cuts aluminum, magnesium and copper up to 5-in. thick and stainless steel up to 2 in. thick, dross-free. It clean-cuts 4-in. thick stainless, nickel, carbon steel (requires no iron powder), "Monel," "Inconel," cast iron, high-alloy and clad steels. It makes precise, high-speed cuts up to 300 ipm, holds tolerances to 1/16 in., leaves a heat band as thin as .006-in. wide.

Get full details . . . see a "live" PLASMARC demonstration. Contact your local LINDE office or write direct.



PLASMARC weld surfacing with "Haynes Stellite" 157-M alloy on periphery of ⅛-in. mild-steel disc.

PLASMARC cutting aluminum, dross-free, at 20 ipm.

LINDE COMPANY
Division of Union Carbide Corporation
270 Park Avenue, New York 17, N. Y.

UNION CARBIDE

Between passes

new consultant

A good many years ago, a young man named Frederick Zimmer learned about welding under the "patient and often stern supervision" of his father, who had received instruction under Fouche in France, Bournonville in the U.S. Now Fred Zimmer is retiring from the active job welding business and the Airco distributorship he operated in Brooklyn. He won't be idle, however, for he will continue to serve as a welding consultant.

Zimmer

Talking to WE, Fred Zimmer found it easy to remember welding as "an art of doubtful results," when the welding of cast iron was "merely probable" and of aluminum, "impossible." Electric welding, Fred recalled, "was done by raising and lowering carbon piles in a barrel of salt water, and by using well-rusted bailing or fence wire for electrodes."

After a year of welding high-pressure vessels in Europe with some of the first electrodes with extruded coatings, he returned to the U.S. in the early thirties. Fascinated by maintenance welding, Fred applied welding to the salvage of heavy equipment in the construction industry, in public utilities, and in shipyards. Additionally, he was a service man in Airco's applied engineering department for 10 years, familiarizing himself with all welding processes.

Armed with this background and experience, Fred took over the job welding business his father had established in 1917. "Large and small castings, special alloys and special weldments in various parts of the country became our lot to repair, maintain and fabricate," says Fred, and together with this service, he also served as an Airco distributor.

Both businesses have been sold to two of his former key employees and Fred is starting business life anew.

dive! dive!

Now hear this—if you're a frustrated submariner with $3,600 burning a hole in your pocket. Sportsman Dry Submarine, Inc., Lomita, Calif., is marketing an all-welded "baby" sub that seats two, submerges to 200 ft or more (that's 30-odd fathoms, matey), and keeps both occupants bone dry. The 12-ft-long craft tips the scales at a ton, so in the vernacular of water-sport buffs who blanch at the thought of hefting a 20-lb suitcase, it's "portable." Sorry, no torpedoes.

Japanese welding data

Up-to-the-minute, English-language information on Japan's rapidly expanding welding industry is now available, thanks to the "Daily News Page", a publication of *The Japan Welding News*. The publisher states that DNP will present data on welding techniques and markets, as well as present and future trends of technical cooperation between the Japanese welding industry and foreign countries. Subscribers will receive six daily editions for every week via air mail at the end of each week.

back issues needed

Get in touch with Howard B. Cary, director of the Hobart Brothers Technical School, Troy, Ohio, if you have any of these back issues of WELDING ENGINEER: Oct., 1917; Jan., July, 1920; Feb., May, 1921; Aug., 1924; May, July, Oct., Nov., 1925; June, 1928; Mar., Apr., May, June, Sept., Dec., 1932; Mar., Apr., 1934; Feb., 1935; Jan., Feb., Mar., Apr., 1936; June, Dec., 1937; June, 1938.

Also, Mar., Apr., June, July, 1939; May, 1940; Jan., Mar., Apr., Sept., 1941; June, Aug., Sept., 1942; Jan., Feb., Mar., Aug., Oct., Nov., Dec., 1943; Feb., Mar., Apr., June, Sept., Oct., Nov., 1946; all but June and November of 1948; all but March and April of 1949; Jan., Mar., 1951; Jan., July, Nov., 1952.

what else is new?

The "unwritten law" forces editors to scrupulously observe news release dates. But what does an editor do when, on October 27, he receives a release dated October 25 and marked: "Do Not Release Before October 12"? Does he laugh? We did. Does he toss same? We did!

watidesay?

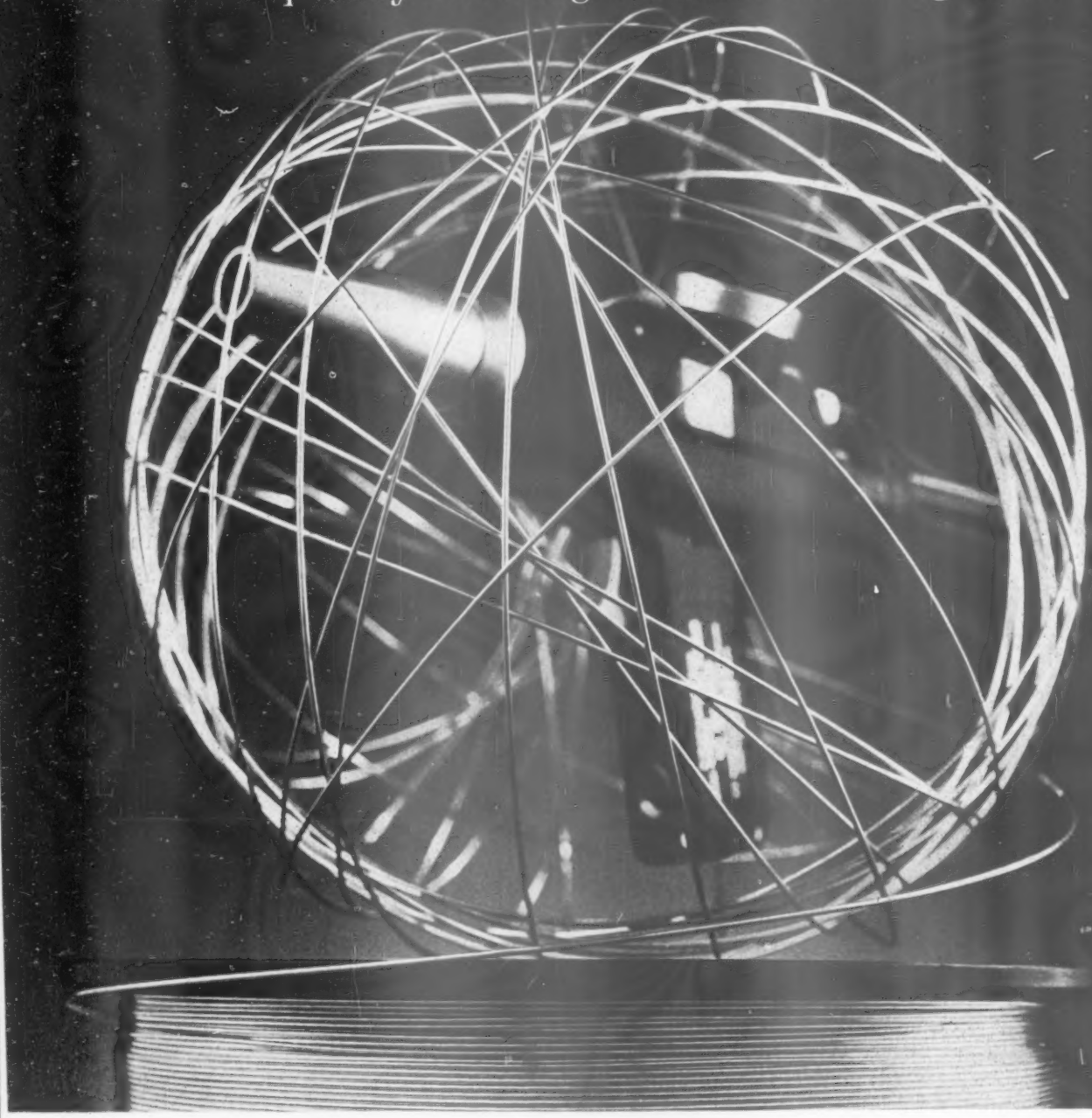
"Suggest to exhibitors that the platinum blonde female who has no knowledge of the product beyond the canned speech, and who monopolizes the time and attention of visitors adds little to the product presentation. I like pretty girls but they are useless as a source of information."

Exhibit A

You have just read a concensus of opinions expressed by industrial convention visitors. You also have just read the thoughts of men who think their bosses are going to read the questionnaire.

Our philosophy: (*a*) platinum blonde females don't know anything about the product, and couldn't care less; (*b*) said females monopolize altogether too much of the busy businessman's time; (*c*) said females are indeed useless as information sources, *but* (*d*) convention booths featuring platinum blonde (or red-headed or brunette) females manage to capture our wholehearted attention every doggone time we attend a convention!

for aircraft quality welding without cleaning costs—



Aircomatic welding wire

Aircomatic (gas-metal-arc) welding wire *is chemically clean* when packaged . . . *chemically clean* when you open it . . . *chemically clean* when you use it.

Specify Aircomatic and you don't have to spend up to 20¢ a lb. to clean your wire. Just open the package, load your feeder and you're ready for aircraft quality welding.

You get X-ray quality deposits too . . . because the chemical composition of Aircomatic wire is rigidly controlled.

You get constant arc conditions and low electrical resistivity . . . because of uniform surface conditions of the wire.

You get a steady, uninterrupted feed rate when you use Aircomatic wire . . . because helix is low and wire finish is mirror smooth.

Another plus value . . . the tensile strength of Aircomatic wire is uniform. And, finally, wear on guide train and contact tube is minor when they're handling Aircomatic wire.

For current price schedule on Aircomatic quality finish aluminum, stainless, copper and steel welding wires . . . call Airco or look in your Classified Telephone Directory under "Welding Equipment and Supplies" for your nearest Authorized Airco Distributor.

AIRCO®

AIR REDUCTION

Your December, 1961

Weld World

As WE went to press, these were the industry's latest developments:

. . Air Products & Chemicals, Inc., has formed a new division, KGM Equipment Co., for engineering, manufacturing and marketing welding and cutting equipment and supplies. New division consolidates operations of K-G Equipment Co., an Air Products subsidiary, and Alexander Milburn Co., subsidiary of Southern Oxygen Co. Air Products recently acquired Southern.

. . Canadian Oxygen Limited is the new name of British Oxygen Canada Limited, and represents major reorganization of marketing operations. Canox will be official trademark. Company incorporates as divisions these former British Oxygen subsidiaries: Northern Welding Supplies, Ltd., North Bay; People's Gas Supply Co., Ltd., Ottawa; St. Lawrence Welding Supplies, Ltd., Belleville; Advance Welding Supply Co., Sarnia.

. . Three Metal & Thermit Corp. stockholders requested a court injunction to prevent merger of M & T and The Udylite Corp., Detroit, reported on this page last month. Plaintiffs claim ownership of 34.9% of M & T stock; merger would require consent of at least 67% of each class of stock.

. . Copper prices declined in the wake of labor settlements in the U. S. and abroad. Spot copper in London dropped more than ¼ cent from a high of 29 cents. Copper producers held their price at 31 cents a pound, noted little demand, but expected November shipments to equal October.

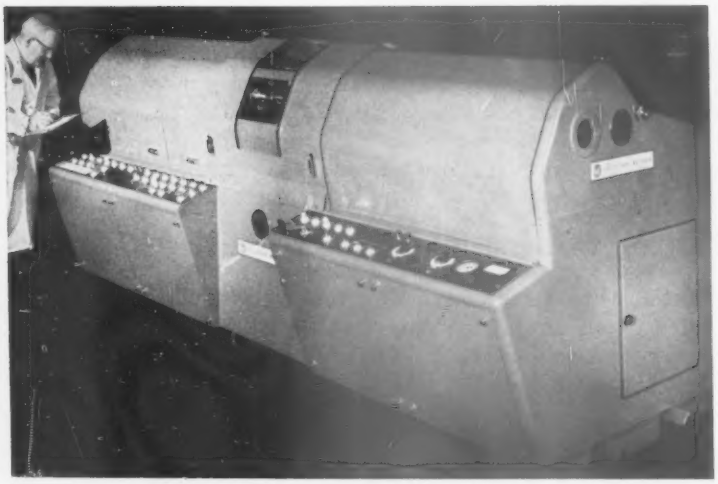
. . Navy scientists have developed a new class of non-magnetic alloys that are weldable. Named Nitinol, the alloys can be hardened and are resistant to corrosion. Potential applications range from space and aircraft components to stainless cutlery. Based on the intermetallic compound TiNi (a combination of titanium and nickel), Nitinol is said to increase in toughness as temperature decreases, yet it is suitable for use up to about 1,200 F.

. . Experiments in color radiography were described recently at the Second Symposium on Physics and Non-destructive Testing, held at Argonne National Laboratory. Physicists there have conducted tests with use of X-rays and conventional color film. An X-ray color plate would show a crack in metal in assorted hues of blue, green or yellow instead of the normal black and gray.

. . Aluminum-to-steel welds are made easier through a new clad metal which serves as intermediate material. "Multi-layer" has aluminum on one side, steel on the other, and is produced by Metals & Controls, Inc., Attleboro, Mass., in straight lengths or coils. Metal-arc welding is recommended for steel-side welds; any fusion process can be used to join aluminum to the aluminum side of the clad metal.

For more information, fold out Welding Info-Aid card on page 89 and circle appropriate numbers as you read.

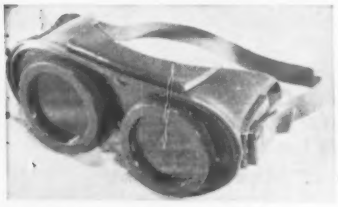
NEW PRODUCTS for you



Automatic friction welder has 500 to 10,000-rpm spindle speeds

Model 15-4 automatic cycle friction welder is self contained unit. Welder with 1¾-sq-in. weld area capacity handles tubing with 2-in. OD and 1½-in. diameter solid bar stock. Tail stock capacity is 3¼-in. diameter with through hole and adjustable solid back stop. Continuously-variable spindle speeds are 500 to 10,000 rpm. Two timers are standard with 0 to 5 seconds and 2 to 90 seconds. Welder has electric clutch and brake, operates with 15-hp drive and 5-hp hydraulic source. Unit operates on 440/220 volt and 60 cycles. **American Machine & Foundry Co.**

Circle No. 1 on Info-Aid Card.



Goggles are used with oxyacetylene processes

Line of protective goggles are designed for use with oxyacetylene welding and cutting. Oxweld No. 27 goggles are soft, pliable plastic sided and can be worn over corrective eyeglasses. Goggles are not normally affected by heat or cold or rapidly changing temperatures. Flat and polished standard filter lenses are available in shades AA-3 to AA-8 in densities and thicknesses meeting Federal Specifications GGG-G-513 and GGG-H-211a. **Linde Co.**

Circle No. 2 on Info-Aid Card.

4.6 kva spot welders are bench models

Bench model spot welders come with standard 220 volts, single phase, 50/60% duty cycle. Model 130-T-Sp comes with 440 volt capacity. This 4.6 kva welder will handle from two pieces of 30-gauge steel up to two pieces of 16-gauge steel. Arms are 12 in. or 18 in. Current control with electronic timer settings 3 to 30 cycles and heat control settings 1 to 5 are included. Welding current at tips is from 4,000 to 7,000 amp. Squeeze pressure is up to 400 lb. Distance setting between electrode tips is 2⅜ in. **Birdsell Products.**

Circle No. 3 on Info-Aid Card.

Rod solders aluminum to aluminum without flux

Eco-Bond '61 rod solders aluminum to aluminum without flux. Aluminum or galvanized sections are preheated with torch to about 717 F. Rod is rubbed in joint area. Fillet is allowed to set and joint is complete. **Paraco Metals, Inc.**

Circle No. 4 on Info-Aid Card.

Film pack speeds X-ray inspection

Film pack features conventional X-ray film bound in special, plastic-coated lead foil disposable cassettes. Magna-Sette pak will be produced in 16, 35 and 70-mm widths in 100-ft rolls. Widths will be broadened to include 6, 7 and 14-in. strips. Features of the testing package include: elimination of air pockets and buckling, no collation of short length film for each weld, pre-marking every 10 in. for simplified indexing and identification, simplified processing on reels or automatic equipment, continuous roll strip form. Pack is designed for use with gamma ray sources. **General Magnaplate Corp.**

Circle No. 5 on Info-Aid Card.

Plasma heat intensified 10 times by new torch

New design has increased the potential heating capacity of plasma torch by more than 10 times. Unit also has push-button heating control. Torch can be operated continuously with argon, nitrogen, helium, hydrogen or any combination of these. Heat input ranges from 130,000 to 600,000 BTU per lb of plasma gas. Temperatures are in excess of 60,000 F and flame can be varied from 1 to 20-in. long. **Thermal Dynamics Corp.**

Circle No. 6 on Info-Aid Card.

Helmets, goggles, shields attach to safety caps

Kwik-Klip headgear adapts Protecto shields, welding helmets and goggles so they can be attached to safety caps. Headgear fits all hard caps. No drilling or altering of cap is needed. Molded hooks snap into position over cap brim; spring tension holds shield, helmet or goggle securely to cap. To remove, hooks are spread and moved up. Attached gear can be raised over cap. **Willson Products Div.**

Circle No. 7 on Info-Aid Card.

OPEN IN DAYLIGHT ONLY!

Gevaert STRUCTURIX

INDUSTRIAL X-RAY FILM

READY-TO-USE PACKAGING:
MORE CONVENIENCE!
GREATER ECONOMY!
GEVAERT QUALITY!

UNIPAC

Individually packaged sheets, in double-wrapped, light-tight envelopes, with cardboard stiffener. Simply remove the enveloped sheet of film from the 100-sheet carton, in broad daylight, and you're ready to shoot! Ideal for use in low Kv range *(about 130 Kv or less)* where lead screens are not normally required. *Available in a wide range of sizes, in choice of D2, D4, D7, D10 or S, for individual requirements.*

BIPAC

Every duplex envelope contains a sheet of D4 and one of D7 film, each in its individual wrap, with a cardboard stiffener. Permits a single radiograph to be made of a subject with greatly varying thickness; D4 recording the thin portion, D7 the heavy portion. Sixty pairs to a box—extremely wide range of sizes! *Other combinations of Structurix Film in Bipac packaging available on special order.*

STANDARD SIZE SHEETS AND ROLLS: Structurix Sheets are available in five emulsion types, in boxes of 75 sheets interleaved or 100 sheets NIF. Wide range of sizes! Structurix is now available in economy bulk packaging—300 sheets interleaved and 500 sheets NIF. Structurix Rolls in 16mm, 35mm, 70mm are available in D2, D4 and D10 emulsion types. *For Structurix samples, write on letterhead to nearest Gevaert Office:*

THE GEVAERT COMPANY OF AMERICA, INC.
321 West 54th Street, New York 19, N. Y.
District Offices: Lincolnwood (Chicago), Ill. • Los Angeles
Dallas • Denver • San Francisco • Atlanta

GEVAERT

For more facts Circle No. 161 on Welding Info-Aid Card

You can depend on

Tempilstik°

temperature indicating crayons

Each batch of Tempilstiks° is certified for melting point by our laboratory — and independently tested for accuracy by a distinguished firm of metallurgical chemists.

A PRODUCT OF AMERICAN INGENUITY

Tempilstiks° provide a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Tempilstiks° are widely used as a standard method of checking temperatures in all heat treating—as well as in hundreds of other heat-dependent processes in industry.

Available in 100 systematically spaced temperature ratings—from 100° to 2500° F.....$2.00 each.

Most leading welding supply houses carry Tempilstiks°. If yours is an exception, write to:

WELDING SALES DIVISION

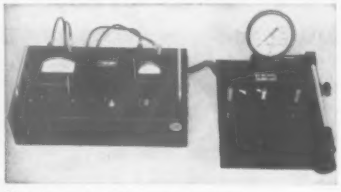
Tempil° CORPORATION
132 West 22nd St., New York 11, N. Y.

Circle No. 162 on Welding Info-Aid Card

Electron beam welder has low energy input

Low energy input electron beam welder has worktable with 3 to 120-ipm variable speed. Work chamber can be enlarged with extensions. The 3-kw welder uses 150,000 volts. Electron optics system focuses beam on 10,000th-in.-diameter spot. Unit welds such materials as molybdenum, tungsten and titanium, ceramics, dissimilar metals, exotic steels and aluminum. **Hamilton Standard.**

Circle No. 8 on Info-Aid Card.



Instrument measures surface resistance

Instrument measures surface resistance of metals in microhms prior to welding. Low surface resistance shows oxides and other contamination have been removed. Unit operates on 115 volts a-c, meets Mil-spec 6858-A. **J. W. Dice Co.**

Circle No. 9 on Info-Aid Card.

Welding booth features quickly removable cover

Fasteners on welding booth cover permit quick removal. Flame-proof cover snaps on all-metal frame, holds material, and snaps off quickly with nothing to lace or untie. Frame is 3/4-in. metal, 6-ft high, covered with fire-resistant duck. Ball bearing casters make it easily mobile. **Can-Pro Corp.**

Circle No. 10 on Info-Aid Card.

No other tool saves so much time, material . . .

Arcair process cuts rework time 93%

10,000 J-47 jet engine nozzle cones of tough, heat-resistant stainless steel were disassembled for reworking by the Arcair process that cut time 93% over previous grinding methods. In addition, Arcair saved 89% on material costs.

This vital job was performed by the Carson Machine & Supply Company of Oklahoma City. The job was completed way ahead of schedule and because Arcair is a mechanical operation that does not depend on oxidation, it was not only effective in removing the stainless steel welds, but did not cause the slightest damage to these vital engine components.

You can save time and materials, too with Arcair. Call your local Arcair dealer or write for further information. Arcair Company, Lancaster, Ohio.

Circle No. 163 on Welding Info-Aid Card

Lightweight noise protector provides safety, comfort

Noise protector fits over ears to cut off disturbing sounds and provide greater safety and comfort. Quiet Ear weighs 12 oz and has replaceable cushion and crown pads of polyvinyl chloride. **Bausch & Lomb Inc.**

Circle No. 11 on Info-Aid Card.

Silver brazing alloy is flux coated

Trucote No. 101 is flux coated silver brazing alloy. Flux is hygroscopic and anhydrous. It will not chip or char. Can be used on ferrous and non-ferrous metals and will join dissimilar metals. Comes in 1/16-in. 3/32-in. by 18-in. sizes. **All-State Welding Alloys Co., Inc.**

Circle No. 12 on Info-Aid Card.

Semi-automatic unit has 250-amp power source

Family of semi-automatic welding equipment includes 250-amp constant-potential power source. Established 600-amp unit for welding heavy stock is available. Wire drive system handles conventional solid and cored wires in all diameters from 0.030 in. to 3/32 in. Four welding gun assemblies are available for light-gauge welding to high current gas-shielded welding in deep grooves. Two guns are water-cooled, two are air-cooled. **A. O. Smith Corp.**

Circle No. 13 on Info-Aid Card.

new

HACKNEY
COMPRESSED GAS
CYLINDERS
the most complete line of high- and low-pressure quality cylinders for industrial, domestic, medical and commercial gases
Hackney
PRESSED STEEL TANK COMPANY

Hackney MILWAUKEE

Cylinder Catalog

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Weldor's magnetic tool aids layout, cutting

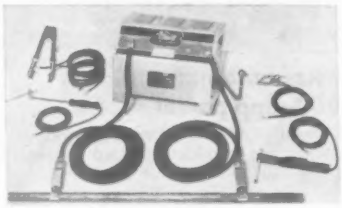
Combo magnetic weldor's square aids layout and cutting in any position. Three 20-lb-pull magnets, floating guide bar, and brass ruler blade are unit features. The 18-in. ruler blade, graduated in 1/8 in. on front and back, is 1 7/8-in. wide. Cutting flame stays 1¼-in. away from frame. Frame is aluminum and blade is splatterproof. **Tod-O Mfg. Co.**

Circle No. 14 on Info-Aid Card.

Low cost arc welder has 30 to 225-amp range

Model 225-W arc welder for regular 230 volt a-c circuits has current range of 30 to 225 amp. Low cost unit gives ample power for electrodes up to 5/16-in. diameter. Duty cycle is 20%. Unit weighs 102 lb, comes completely equipped with full set of accessories. **Bren/Weld Corp.**

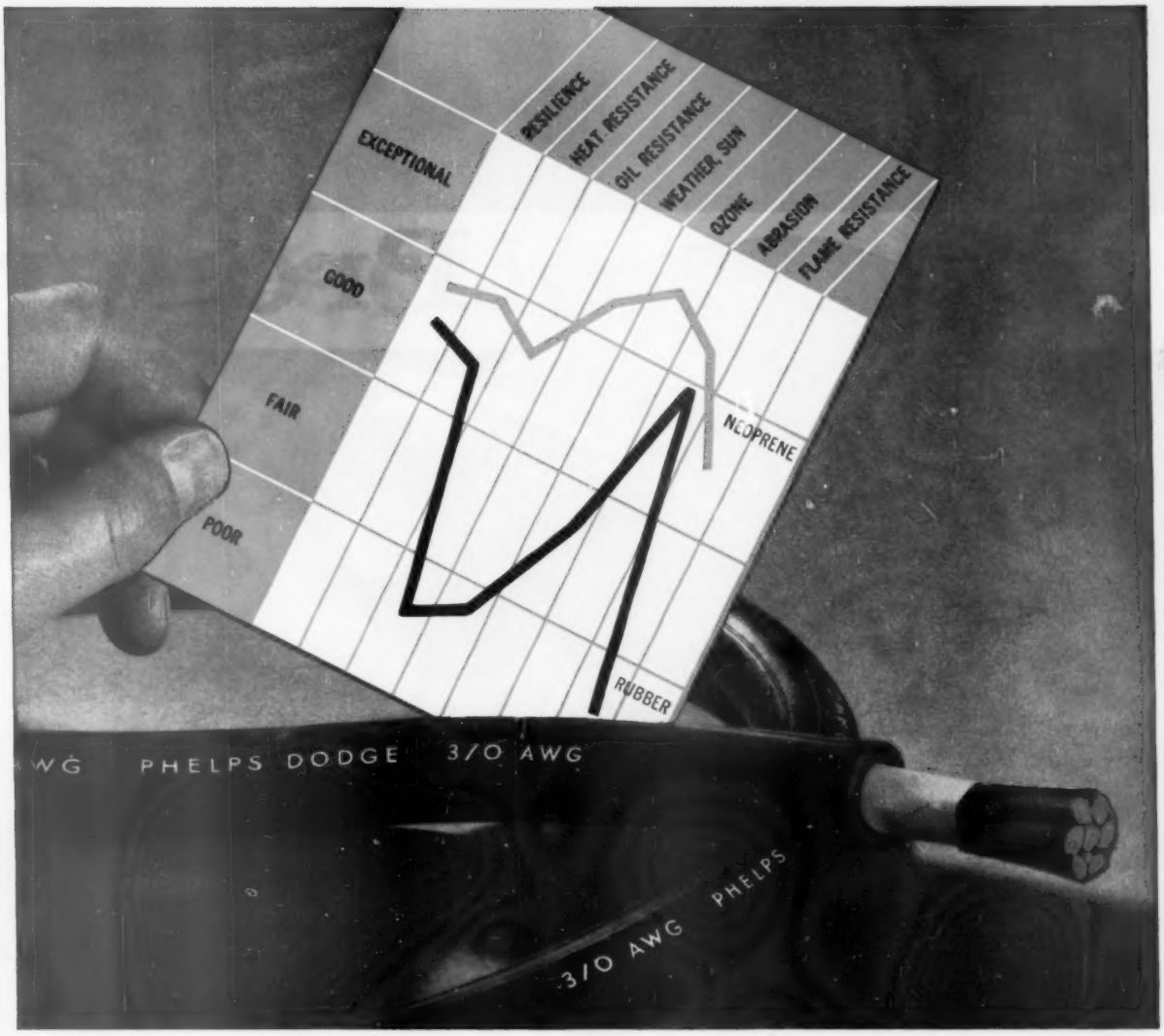
Circle No. 15 on Info-Aid Card.



Electric pipe thawer is completely safe

Safe torchless Therm-O-Tron pipe thawer is simply plugged into an outlet and clamped on pipe. Unit will melt frozen pipes as far as 80 ft. away. **Trindl Products, Ltd.**

Circle No. 16 on Info-Aid Card.



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Consider the longer-wearing qualities of Phelps Dodge Habirprene Arc Welding Cable!

Specifying Phelps Dodge Habirprene (Neoprene) arc welding cable is a sure way of reducing your yearly welding cable costs. Habirprene welding cable outwears rubber cable —in most applications lasts many times longer under the severest working conditions. Chart (above) shows proof of Habirprene cable's sturdiness and durability.

Welders prefer the easy-to-use features of Habirprene cable. Its outstanding flexibility and rugged strength make handling easier on jobs where the cable undergoes extreme physical wear and tear. Habirprene cable meets the full requirement of A.S.T.M. D752.

See your authorized Phelps Dodge distributor for this superior welding cable with the indelible gold marking.

Phelps Dodge also makes a full line of rubber arc welding cables and welding power supply cables. All these cables are available from stock.

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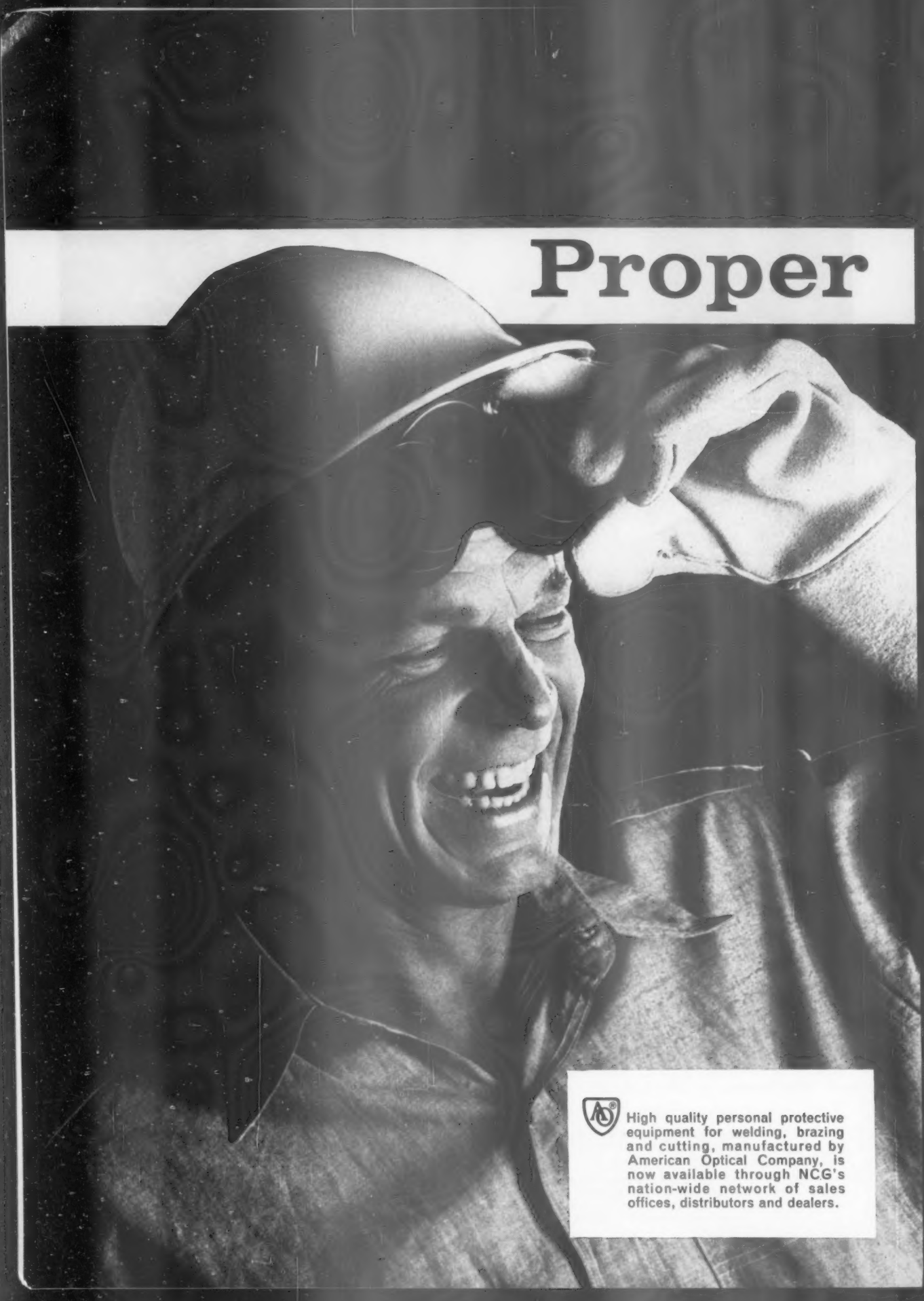
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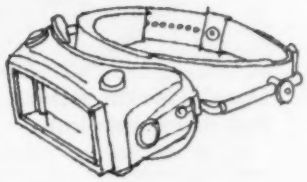
High quality personal protective equipment for welding, brazing and cutting, manufactured by American Optical Company, is now available through NCG's nation-wide network of sales offices, distributors and dealers.



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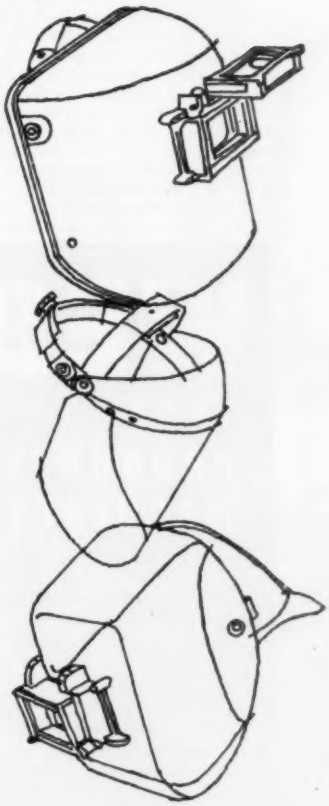

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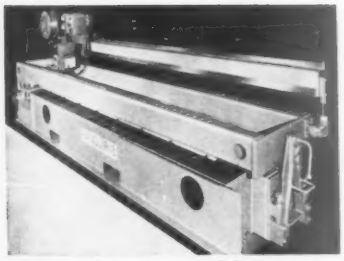
For more facts Circle No. 168 on Welding Info-Aid Card



Seamer fusion welds flat sheet and plate

Welder will join flat, corrugated or specially-formed sheet and plate. Automatic welder will seam stock widths of steel, stainless, aluminum or nickel alloys into large sheets without clamping distortion. Water-cooled clamp allows 100% penetration. Seamer can weld cylinders from inside at floor level. **Pandjiris Weldment Co.**

Circle No. 17 on Info-Aid Card.

Units feed filler wire for Mig, Tig

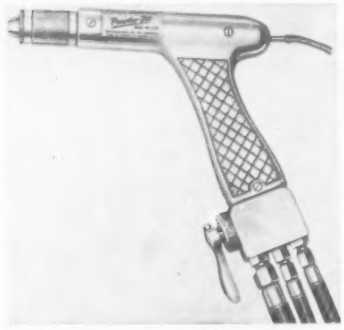
Two filler-wire feeders are for automatically feeding cold filler-wire in Mig, Tig operations. HMF-A feeders can be used for both automatic and semi-automatic applications. One feeder has 12 to 84-ipm wire-feed rate. Second feeder has 20 to 140-ipm rate. Units handle hard wire diameters from 0.020 to 1/16 in. Feeders are equipped with three-dimensional positioning. **Air Reduction Sales Co.**

Circle No. 18 on Info-Aid Card.

Fire extinguisher holder made for welding screens

Fire extinguisher holder made for firm's portable welding screens reduces fire danger. Holder attaches quickly with two wing nuts to lower bar of screen. Holder handles extinguishers up to 8-in. diameter. **Singer Glove Mfg. Co.**

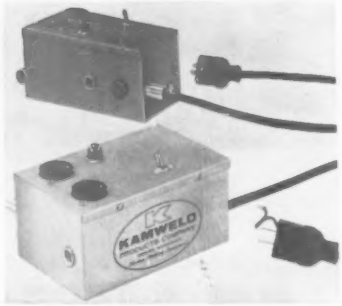
Circle No. 19 on Info-Aid Card.



Unit sprays 16-lbs of hardfacing alloy per hour

Model No. AL-305 unit can spray up to 16 lbs per hour of hardfacing alloys and can spray a broad line of commercial metal powders. Model No. AL-205 can deposit ceramics such as zirconia and alumina at high speeds. **Metallizing Co. of America, Inc.**

Circle No. 20 on Info-Aid Card.



Unit conserves inert gas in plastic welding

Model KGS is a compact inert-gas and air selector unit for use with plastic welding equipment. Pressure-sensitive safety switch provides protection from burning out heating elements by opening electric circuits when line pressure drops below 10 lb. Unit eliminates waste of costly inert gas. **Kamweld Products.**

Circle No. 21 on Info-Aid Card.

Gauge measures metals 1/10,000,000-in. thick

Lightweight electronic thickness gauge uses radiation to measure metal films as thin as 1/10,000,000-in. Back-scatter gauge uses radiation source which emits beta rays. Portable gauge can be used on complex and unusual shapes. **Twin City Testing Corp.**

Circle No. 22 on Info-Aid Card.

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TANK PRODUCTION MACHINERY

Horn Jigs
Offsetters
Seam Welders
Turning Rolls
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Assembly Presses

Model M-2 with rotating turntable for reversing ends when both ends are to have offset flanges.

Complete catalog on any type or size machine furnished on request.

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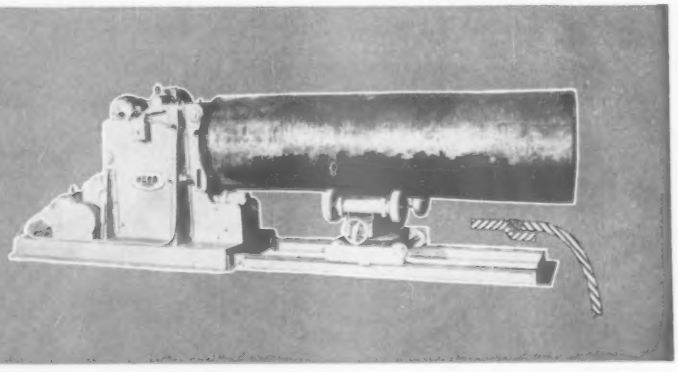
for forming an offset flange around shell ends to facilitate automatic welding of tank heads.

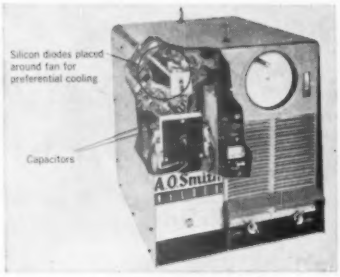
- Eliminates chill rings
- Improves concentricity of shell ends
- Shortens fit-up time
- Helps reduce welding time

Available in four models to handle up to ½" plate.
With standard dies.
New M 2-P pipe duty 6" to 30" up to ¼" thick.



WEBB ASSEMBLY PRESS

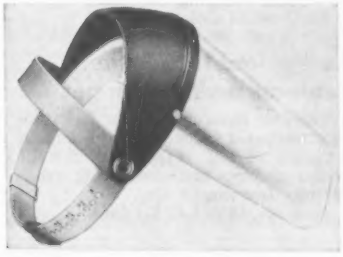
Companion fixture for assembling heads to shells — shells to shells.
• 25 tons closing pressure • Built-in fit-up rolls • Built-in kick-out lift • Adjustable for tank diameter and length
3 standard sizes to handle up to 72" diameter
Combination Assembly and Girth Welding Machines also available.



Industrial welder converts a-c to d-c

A silicon rectifier package for converting a-c to d-c welding current is now optional equipment with Monarc industrial welder. Welder comes in 300, 400 and 500-amp models. Units are NEMA-rated at 60% duty cycle for manual metal arc welding. Open circuit voltage for easy striking with low hydrogen electrodes on a-c is 80 volts, 72 for d-c. **A. O. Smith Corp.**

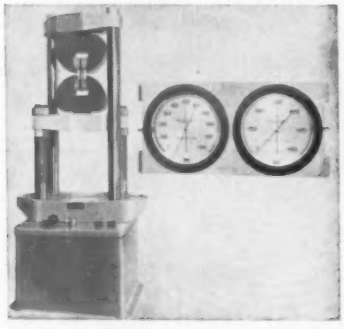
Circle No. 23 on Info-Aid Card.



Plastic faceshield fits 6 to 8¼ head sizes

Plastic faceshield adjusts to size from 6 to 8¼ in ⅛ increments. Lug on headgear is placed into a slot at selected size. Lug is locked with leather strap. Vinyl foam sweatband is an added feature. **American Optical Co.**

Circle No. 24 on Info-Aid Card.



60,000 lb tester has 2 load systems

Testing machine for conducting tensile, transverse and compression tests has two independent load operating systems. The hydraulically-powered Model UT-6 has low-range system operating up to 10,000 lb and high-range system to 60,000 lb. Maximum load control device allows setting desired load for subsequent tests. **Detroit Testing Machine Co.**

Circle No. 25 on Info-Aid Card.

NEW–OXWELD C-66 TORCH CUTS 30-IN. METAL IN ONE PASS–OPERATES ON NATURAL GAS, BUTANE, PROPANE. YOU CAN SLASH CUTTING COSTS 15% OR MORE BECAUSE OF FASTER STARTS AND TREMENDOUS PRE-HEAT CAPACITY *

* As proven in actual competitive tests—compared with other cutting torches. Tremendous preheat capacity and gas flows (up to 300 cfh natural gas and 3,000 cfh oxygen) enable C-66 to start faster and cut quicker than any other torch on the market. Use it for *all* flame-cutting from thin sheet metal to largest risers. Four interchangeable injectors make the C-66 adaptable to all fuel gas pressures from sub-atmospheric to 20 psi.

The C-66 is available in 28 combinations of lengths and head angles. Longer models such as 42-inch model shown here are ideal for riser removal.

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LINDE COMPANY

"Linde," "Oxweld," and "Union Carbide" are trade marks of Union Carbide Corporation and used by its Division, Linde Company, 270 Park Ave., N. Y., N. Y.

Portable X-ray unit has forward throw

Forward-throw feature of portable X-ray unit enables operator to radiograph, in a single exposure, the entire girth weld in the closed end of a pressure vessel as small as 24-in. diameter. Machine is rated 5 MA at 250 kvp. Wide direction beam covers 14 by 17-in. film at 24 in. Unit weighs 152 lb. **Picker X-Ray Corp.**

Circle No. 26 on Info-Aid Card.

Rod-marking ink withstands 2,500 F

Heat-resisting ink for use on welding rods, steel, copper and brass can withstand temperatures to 2,500 F. Ink can be used to put identifying marks on welding rods, to mark heat-treated metals. Ink comes in 1 to 55-gal drums. **F. G. Okie, Inc.**

Circle No. 27 on Info-Aid Card.

Variable speed drives suited for positioners

Variable speed drives with an electronic control are suited for rotating systems in which speed must be controlled. This includes positioners, hoisting units and various automated machines. Line offers ½% to 2% regulation of set speed. Custom drives are available with 0.1% regulation. **Tenney Engineering, Inc.**

Circle No. 28 on Info-Aid Card.

Electric plastic welder weighs only 14 ounces

Electric plastic welder weights 14 oz and is 12¾-in. long. Five interchangeable heating elements, 180, 240, 320, 400, 600 watt, 110 volts, a-c, provide temperatures which allow welding with all rod sizes and types. No rheostats, resistors or other extra equipment are needed to control electric current. Air requirement is 15 psi maximum for PVC. **Seelye Craftsmen Inc.**

Circle No. 29 on Info-Aid Card.

Hardfacing alloy yields 50-54 Rockwell C

Alloy No. 96 furnished as coil wire gives multi-layer and single-layer overlays with 50 to 54 Rockwell C as deposited. Applications include maintenance of pinch rolls, scale breakers, bearing surfaces of table rolls, and seats and burden areas of blast furnace bells in steel plants in addition to repair of large slide valve seats in oil refineries. **Coast Metals, Inc.**

Circle No. 30 on Info-Aid Card.

Helmets, goggles attach to safety cap

Line of welding helmets and goggles can be attached to Dura-Guard safety cap. Insulating mounting block is used to attach without the need for drilling holes. **American Optical Co.**

Circle No. 31 on Info-Aid Card.

Coating prevents rust through galvanic action

Devcon Z seals out moisture and prevents corrosion by galvanic action. Coating contains 95% pure zinc and 5% epoxy binders. Coating protects both iron and steel. **Devcon Corp.**

Circle No. 32 on Info-Aid Card.

Low-priced tachometer features multiple ranges

Low-cost fixed tachometer has three switch-selected ranges and full-range accuracy of 1%. Type 47M unit includes pick-up and connecting cable. **Metron Instrument Co.**

Circle No. 33 on Info-Aid Card.

Accuracy . . . in the shop or in the field is the trademark of H & M Pipe Cutting and Beveling Machines. H & M performance is fast, efficient . . . even under the most rugged conditions. H & M's are easy to operate and untrained personnel become experts after just a few minutes' practice with an H & M Machine.

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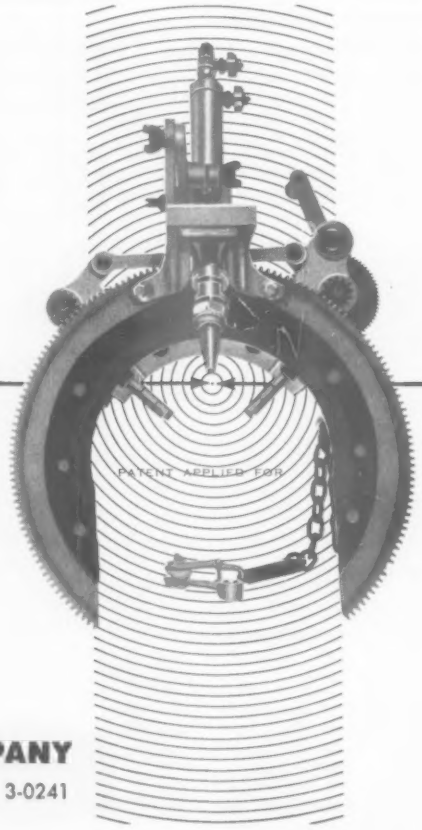
H & M Machines can put more accuracy . . . more speed . . . more profits . . . into your pipe fabrication. Write today for catalog sheets and price lists on H & M's complete line of machines and accessories.



PIPE BEVELING MACHINE COMPANY

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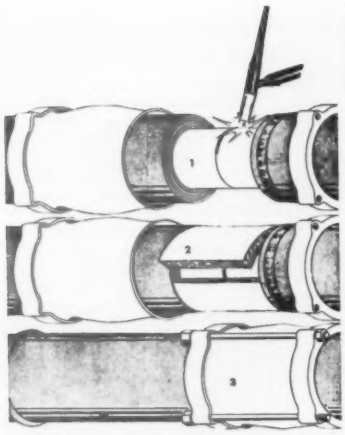


Welded piping features vacuum insulation

Vacuum-insulated welded piping is designed for handling cryogenic fluids. Piping eliminates need for auxiliary vacuum piping equipment. Standard 40-ft lengths and 2-in. and 4-in.-diameter fittings are available. Other sizes, 1/4 in. and larger, can be made. Field erection is simple (see cut). First, inner pipeline is Tig welded. Second, joint is insulated. Third, a coupling is bolted over the finished joint. **Linde Co.**

Circle No. 34 on Info-Aid Card.

3-amp, 5-amp rectifiers serve as welding controls

Series of 3 and 5-amp silicon-controlled rectifiers provide switching on welding controls. Types 3RC5A-3RC40A 3-amp series has 25 to 400-volt PRV range. Types 5RC2A-5RC40A also have 25 to 400-volt PRV range. **International Rectifier Corp.**

Circle No. 35 on Info-Aid Card.

Welder/power plant output increased

AEA-200-L gas engine driven welder/power plant is now powered by 15-hp Onan air-cooled engine. Welder output has thus been increased to 250 amp or 225 amp at 100% duty cycle. Model also provides 1-kw d-c while welding and delivers 5-kw 115/230-volt a-c for running appliances, etc. Engine features twin mufflers, automatic spark advance and rotators on all valves. **Miller Electric Mfg. Co.**

Circle No. 36 on Info-Aid Card.

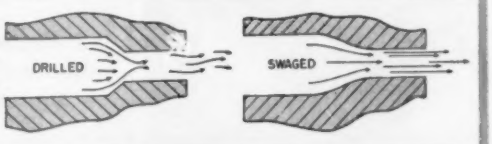
Genuine

OXWELD NOZZLES ARE PRECISION-MADE, INDIVIDUALLY FLAME-TESTED TO CUT BETTER AND SERVE YOU LONGER. CHROME-PLATING ALONE BOOSTS LIFE OF NOZZLES OVER 150%*

* Durable, wear-resistant chromium protects OXWELD nozzles from the major causes of replacement. It sheds slag and spatter, resists corrosion and reflects more than 95 per cent of radiant heat. Mixing of gases in the torch—not the nozzle—eliminates flashback and assures thorough mixing of gases.

Slag and spatter adhere to non chrome-plated nozzle (top), clog the preheat orifices. After the same length of service, preheat orifices in a chrome-plated OXWELD nozzle (bottom) are free of slag and spatter.

Gas Flow—Drilled Nozzle vs. OXWELD Swaged Nozzle. Abrupt angles in a drilled gas passage cause turbulent gas flows, inefficient preheat flames. Rounded and polished angles of a swaged passage produce smooth, even gas flows, and stable, efficient flames.



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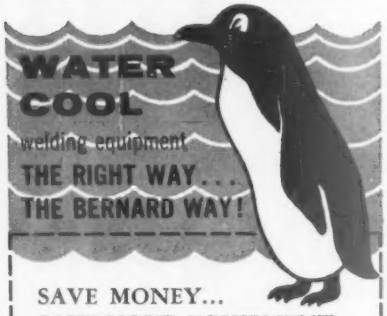
Circle No. 172 on Welding Info-Aid Card



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...with the right method of water cooling for your equipment. Bernard, the leading name in *self-contained* coolant circulators, offers eleven individual models for immediate delivery . . . one for every type and size of welding application.

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WELDORS LAYOUT & CUTTING SQUARE

The COMBO Square is the most versatile and useful tool now available to the modern weldor. This rugged and very accurate slip square really fits a weldor's work. Three powerful magnets, cast in the frame, hold it firmly in any position and makes it the handiest cutting guide you have ever used. It will pay for itself again and again in time saved.

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Mfg. by **Tod-O Manufacturing Co.**
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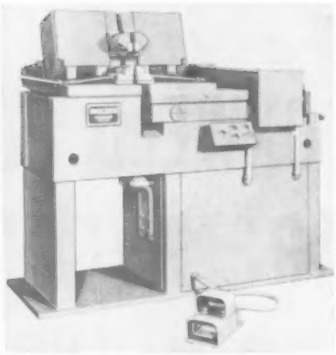
Circle No. 173 on Welding Info-Aid Card



Flash butt welder covers wide application range

BPR.O flash butt welders are designed to cover wide range of commercial applications. Welders are air-operated rocker-arm low-impedance units. Frame sizes range from 0.01 through 0.04. Available in 20, 50, 100 and 150 kva at 50% duty cycle. Welders can accommodate 6-in. maximum stock width 3-in. maximum stock diameter, and 5-in. minimum diameter ring. Upset force up to 20,000 lb and clamp force up to 30,000 lb is provided at 80 psi line pressure. **Sciaky Bros., Inc.**

Circle No. 37 on Info-Aid Card.

Welding wire comes in 1-lb, 25-lb spools

Stainless steel welding wire is packaged in 1-lb plastic disposable spools and 25-lb pressed board disposable spools for automatic welders. Wire also comes in 3-ft rods for manual metal arc welding. Available alloy types are 308, 309, 310, 316 and 347. Wire diameters range from 0.035 to 0.187 in. **National-Standard Co.**

Circle No. 38 on Info-Aid Card.

3 electric infrared heaters are portable

Three portable LP-gas electric infrared heaters are designed for construction, industrial and general use. One model is for small areas. Another is a heavy duty unit with adjustable tripod stand. Third model has stand mounted on casters for easy rolling to any location. Heaters are available in several wattages. **Insto-Gas Corp.**

Circle No. 39 on Info-Aid Card.

Spooled aluminum bronze designed for Mig welding

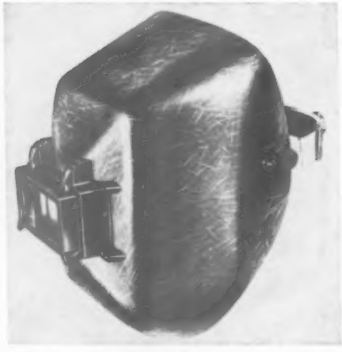
Spooled layer-level wound aluminum bronze is designed for Mig welding. Alloy can join bronze to copper or low alloy and carbon steels to stainless steel. Aluminum bronze can be used to surface steels and for hub sections of manganese bronze ship propellors. Tensile strength ranges above 60,000 psi with 60% elongation. **All-State Welding Alloys Co., Inc.**

Circle No. 40 on Info-Aid Card.

D-c arc welders have protected control panels

Protected control panel is feature of new line of d-c motor generator arc welders. Meters and controls are protected by visor which extends over entire control panel. All models have multi-range dual control with 10 main ranges of welding current and 100 steps of volt-amp adjustment in each range. Rated 60% duty cycle, 200, 300 and 400-amp models are available for 50 or 60-cycle operation. **Hobart Bros., Co.**

Circle No. 41 on Info-Aid Card.



Fiber glass helmets allow wide visibility

Fiber glass welding helmets come in curved-chin style and straight bib type. Wide vision helmets are available with 4½ by 5¼-in.-wide vision lens cell. Also available are narrow-front shells with flanges at top, bottom and sides. All helmets have friction joint with nylon pressure plate and improved tension spring. Positioning device permits presetting of helmet to one of four working positions. **American Optical Co.**

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Wire-feed welding torch weighs only 22 oz

Wire-feed all-position welding torch weighs 22 oz. Model HT-1 is rated 100% duty cycle at 200 amp and handles 0.030 to 0.047-in. wire. It can be used with CO_2 in reactor and spray ranges and with argon or argon gas mixtures in the reactor range. Nozzle seat design allows tool-less nozzle rotating to 360 deg. **Westinghouse Electric Corp.**

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350-amp electrode holder stays cool while welding

This 350-amp holder connects welding cable directly under the welding electrode into the lower jaw. The lower jaw is reversible for longer life and can easily be replaced or repaired. All holders are 100% insulated and all insulated parts are molded from glass reinforced thermosetting compound with high strength and heat resistance. **Kulite Welding Specialities, Inc.**

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Slide fastener used on welding cable covers

Electric welding cable sheath (above) is a typical application of nylon-zip slide fastener. Zipper provides quick access to power, gas, water and switch control cables. Teeth and tape are lightweight, nylon. **Waldes Kohinoor, Inc.**

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OR DRAG 'EM,

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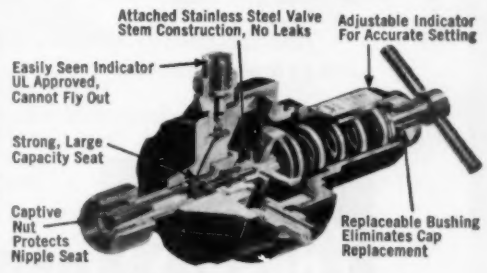
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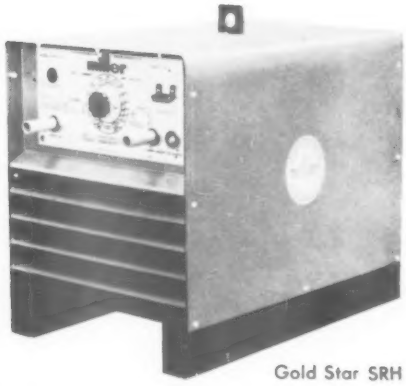

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Our purpose: to define, describe and promote the use of welding and its allied processes in every production and maintenance activity to all phases of industry and business.

Return to individualism

MORE THAN 68 million persons are working in this country, according to a recent report. However, the same report also pointed out that our relief rolls are the largest in our history.

What has happened to the people of this country? Once we were self-reliant; now we are government-reliant. Why does American youth emphasize security over opportunity?

If the Pilgrims had placed such inordinate value on old age pensions and unemployment insurance, none of them would have made the trip on the Mayflower. If the American colonist had been concerned with social security, there would have been neither Minute Men nor a Revolutionary Army; nor would our frontiers have been pushed westward.

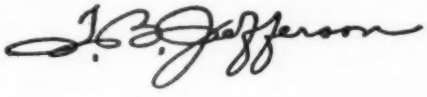
The adventurer has always blazed the trail to progress — adventurers of the frontier such as Meriwether Lewis or John C. Fremont; adventurers of the mind such as the man who first experimented with a crude device to burn acetylene with oxygen.

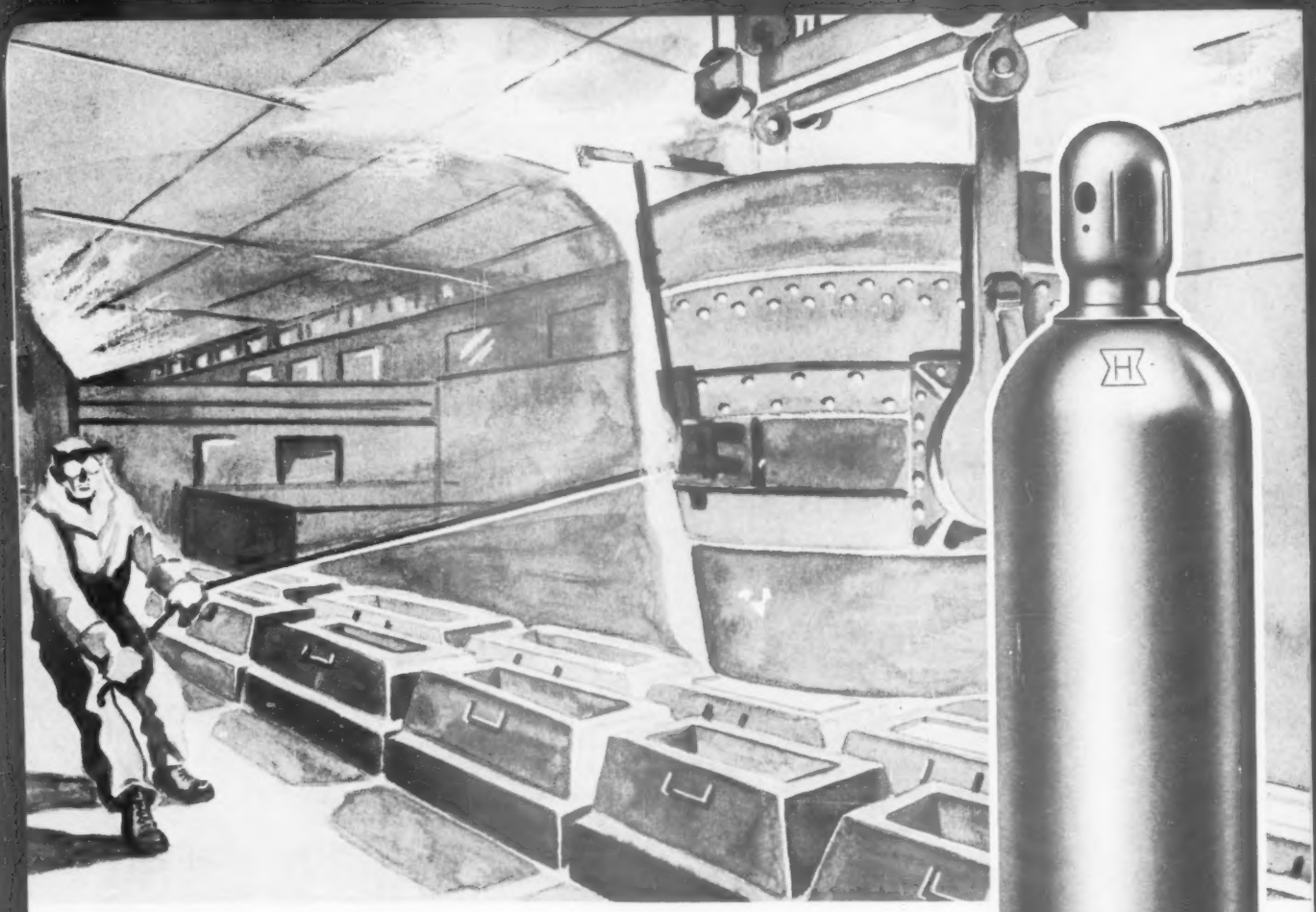
Some of these explorers and researchers died young; many lived to an impoverished old age, neglected and forgotten. But whether successes or failures, if they had not dreamed, struggled and fought, the world would be much poorer.

Socialism has never paid off except to spread poverty to a uniform level; individualism has meant a higher standard of living for all.

It is time to keep faith with our Founding Fathers — time to resume our willingness to take on individual responsibilities, to try new adventures into the unknown, to pit our courage against the future.

Our forefathers built a mighty nation. If we want it to continue, we must return to the original blueprint.





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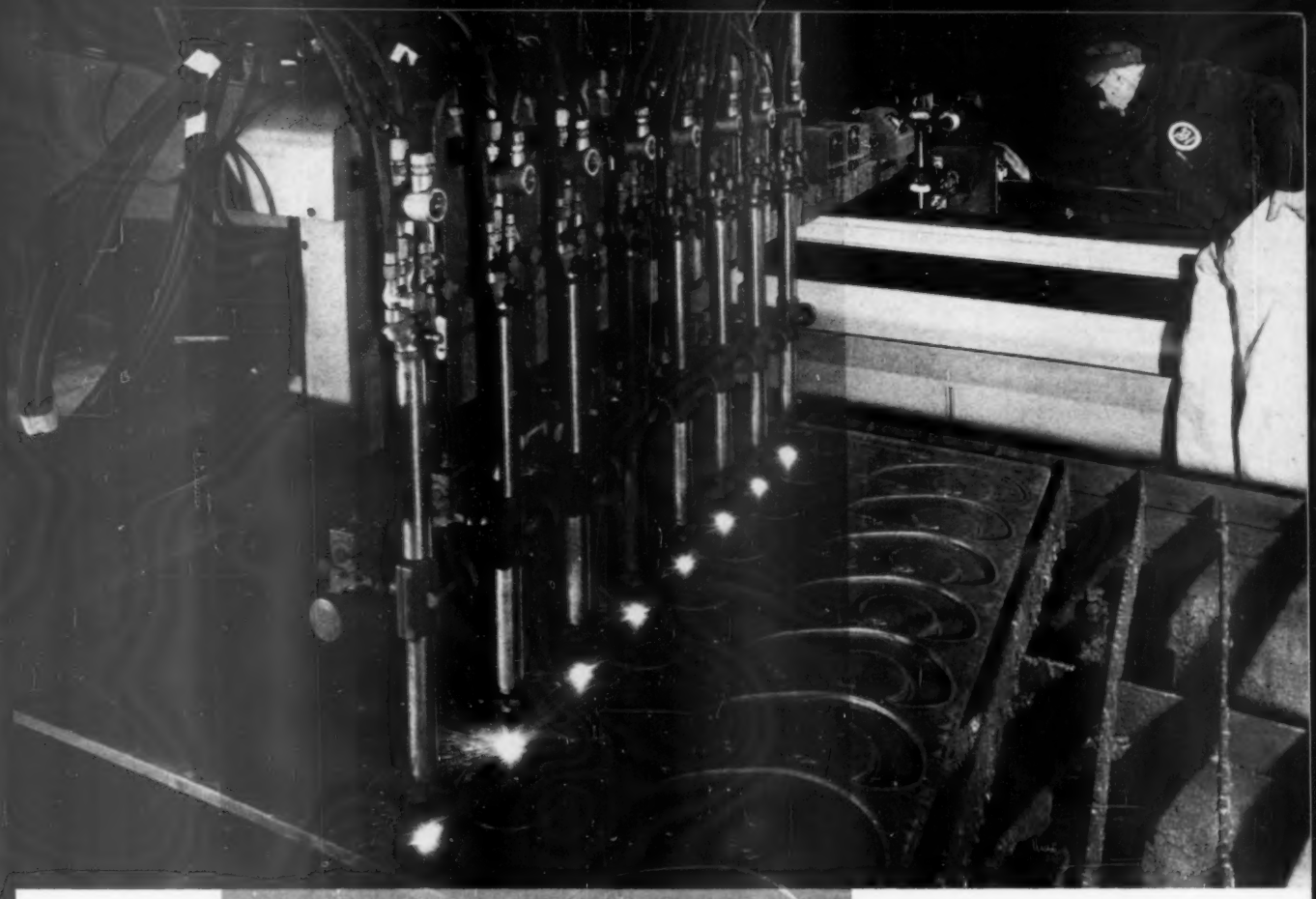


THE FUEL GASES: HOW TO EVALUATE THEM

by Harris A. Goodwin
The Bastian-Blessing Co.

THE fuel gases

ARE YOU USING the most economical and efficient fuel gas in your oxygen cutting operations — or are you thinking of changing?

Before making your decision, consider these factors:

1 — Cost of the new gas.
2 — Cost of its BTU value.
3 — Cost of transporting it.
4 — Container tare weight in proportion to BTUs produced.
5 — Cost of gas consumption in cylinder oxygen.
6 — Flame propagation speed of the oxy-fuel combination.
7 — Flame temperature.
8 — Ease of efficient flame adjustment.
9 — Operator acceptance.

To properly evaluate these factors, ground rules consistent with the user's objectives must be established.

For example, in plate edge preparation prior to welding, accuracy of the cut edge, its relative freedom from slag, icicles and other occlusions will likely be of primary concern.

On the other hand, in field demolition work (reduction and

scrapping of structural members), speed would take precedence over perhaps all other factors, depending on the labor factor's influence.

Some of these objectives could be: maximum lineal speed of cut; minimum tolerance in dimensional variation; maximum cleanliness of cut edge; sharp squared edges; beveled cuts; and plate edge preparation for welding.

Frequently, the different personnel involved will have objectives conflicting with the primary concerns of other interested parties. Or at least they will not be told of them.

The buyer may be attuned only to product cost in terms of cost per cylinder without regard to relative cost per thousand BTUs of heat value. The operator is primarily concerned with ease of flame adjustment, manipulation of the tool and the speed of cut. Between the two extremes is the production engineer whose objective is the end product he is trying to build.

You must consider your objective before determining the ideal fuel for the particular application. A review of some of the physical, chemical and economic characteristics of the various fuel gases will aid you in your choice of the proper one.

acetylene

Produced from the chemical reaction between calcium carbide and water, acetylene is an endothermic, unstable gas which is richest in carbon and produces the highest flame temperature of all known fuel gases.

By weight it is approximately 92% carbon and 8% hydrogen. When one volume is efficiently mixed with one volume of cylinder oxygen, a neutral flame is produced which has an incandescent cone with a theoretical flame temperature of 6,300 F.

This temperature is not approached by any other fuel gas, although it is exceeded in the combustion of certain incendiary metals such as magnesium and finely divided aluminum.

The additional 1½ volumes of oxygen required for complete combustion of the acetylene molecule are automatically supplied from the ambient atmosphere. Actually, the measurable temperature of the oxyacetylene preheat flame can be increased by adjusting the flame to a slightly oxidizing character.

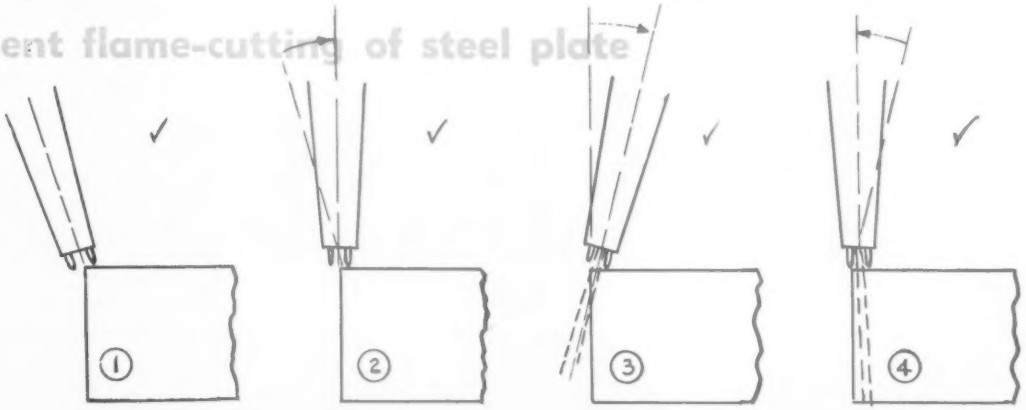
The economic advantage of this greater expenditure of oxygen is doubtful, although it does exist in the case of some of the other gases.

Because of its high flame temperature, preheat time is very short. In addition, where fusion welding is to be done, or where cut members are to be tack welded, acetylene's adaptability is a unique advantage.

Acetylene's cost in terms of BTUs is substantially higher than that of other hydro-carbon fuel gases, but lower than that of hydrogen. However the ratio of cylinder oxygen which must be consumed to combust acetylene is fairly well controllable and can be accurately predicted so as not to vary substantially above the 1:1 ratio.

Flame propagation speed of the oxyacetylene mixture is 330 ft per second at normal temperature — exceeded perhaps only by that of oxyhydrogen. Thus, mixers must be designed with precision, and care employed in proper ad-

Efficient flame-cutting of steel plate



(1) Start to preheat; point tip at angle on edge of plate.

(2) Flame tips just touch; rotate tip to upright position.

(3) Press oxy valve slowly; as cut starts, rotate tip backward slightly.

(4) Now rotate to upright position without moving tip forward.

THE fuel gases

justment of the relative pressures to utilize the gas.

As a result, the tendency to sustain backfire and/or pre-ignition from tip overheating, as well as flashback, will be minimized.

Since acetylene paralleled oxygen in the earliest development of oxyacetylene welding and cutting, it is available wherever oxygen is offered for sale.

One handicap of acetylene, however, is the high tare weight of the container. A 275 cu ft capacity cylinder, 12-in. diameter by 38-in. high, will weigh nominally 230 lb. Thus, 275 cu ft of capacity requires transportation of approximately 0.85 lb of container per cubic foot of fuel having a BTU value of 1,475.

Many styles of oxyacetylene cutting tips are available for most torches: light preheat for clean mill finish steel; medium preheat for fast cutting; heavy preheat for dirty, rusty, chemically-corroded or heavily painted steel, etc.

Thus, it is possible to produce exceptionally clean or especially rapid cutting, as the application dictates, and also to apply the tool where specific cutting requirements are encountered.

The universal adaptability of oxyacetylene to virtually all phases of metal treatment (cutting, welding, brazing, silver soldering) practically ensures its continued high acceptance by most operators.

propane

Propane is an abundant and versatile fuel, rich in BTUs and with a boiling point of —44 F, which enables it to vaporize under most required domestic and industrial operating applications. It develops a vapor pressure of approximately 100 psi at 65 F when confined, compressed and liquefied.

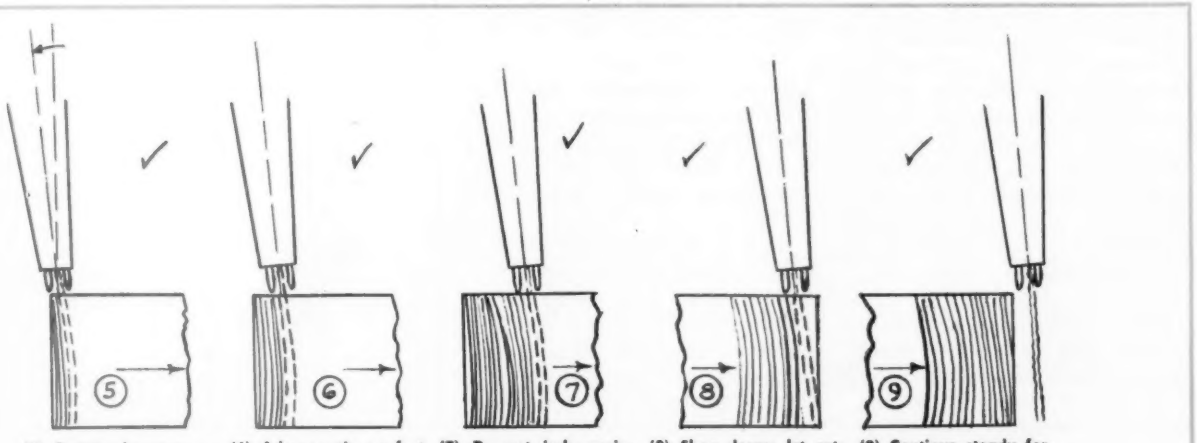
(Butane, another LP fuel gas, is no longer practically available because of the tremendous demand by the petrochemical and plastics processing industries. It is approximately 83% carbon by weight, develops 3,250 BTUs per cubic foot of vapor, boils at about 30 F.)

LP gas is available almost anywhere on the North American continent in 20-lb and 100-lb capacity cylinders, the latter measuring nominally 14½-in. diameter by 42-in. high.

One cubic foot of propane contains nominally 2,520 BTUs of heat compared with nominally 1,475 BTUs per cubic foot for acetylene. The higher BTU value, however, must not be confused with flame temperature.

Because of its chemical structure, the maximum temperature of oxy-LP gas is approximately 5,300 F, and is achieved by using five volumes of oxygen from the cylinder for each volume of propane burned. Therefore, to produce this maximum flame temperature requires three times as much oxygen to produce the same volume of heat compared with oxyacetylene (3/5 cu ft of propane equals 1 cu ft of acetylene in BTUs).

At this maximum flame temperature of 5,300 F, oxypropane is 1,000 F lower than the oxyacetylene flame, making it totally unacceptable for fusion welding of iron or steel. The volume of oxygen required to develop 5,300 F produces a highly oxidizing flame which would burn iron.



(5) Rotate tip more so it points slightly in direction of cut. (6) Advance tip as fast as good cutting action will permit. (7) Do not jerk; maintain slight leading angle toward cut direction. (8) Slow down; let cutting stream sever corner edge at bottom. (9) Continue steady forward motion until tip has cleared end.

A conventional 12-in. by 38-in. acetylene cylinder holds 275 cu ft of gas having a heat value of 1,475 BTUs per cubic foot, while a conventional domestic bottled gas cylinder, 14½ in. by 42 in., holds 100 lb of propane which will vaporize into 850 cu ft of gas with a heat value of 2,520 BTUs per cubic foot.

Under this comparison, the acetylene cylinder contains 405,075 BTUs and has a tare weight of approximately 230 lb. The propane cylinder contains 2,146,250 BTUs and has a tare weight as high as 100 or as low as 70 lb, or an average of 85 lb.

This stored volume of BTUs is equal to the heat value contained in 5.3 acetylene cylinders charged to the assumed capacity. Therefore, to transport the equivalent BTUs of acetylene requires transportation of nominally 5.3 times 230 lb of container weight, or 1,219 lb.

Thus, the ratio of container tare weight of acetylene to propane is slightly more than 14:1. This can be an important factor in common carrier delivery, and in certain applications, this ratio would sway the decision strongly in favor of propane.

The molecular structure of acetylene is such that the triple bond between the carbon atoms and the hydrogen atoms, when broken, releases a considerable amount of heat. This is observable in the incandescent inner cone of the oxyacetylene flame where the white hot carbon atoms are being oxidized.

At least a substantial part of the incandescence is furnished from the breakdown of the molecule itself, while almost simultaneously the initial oxidation of these hot carbon atoms takes place.

Propane, however, is so constructed that its speed of flame propagation is substantially slower. This is observable in the inner blue cone of the flame when combusted with oxygen. The cone has a substantially pale appearance compared with oxyacetylene.

There is no clear definition to designate an oxypropane flame which would be described as neutral. By varying the amounts of cylinder oxygen supplied, the temperature and flame characteristics will vary substantially.

To produce an oxypropane flame having the lowest oxidizing characteristics, and still develop an optimum flame temperature, requires approximately three volumes of cylinder oxygen (to one of propane), producing a flame temperature of approximately 4,600 F.

As the proportion of oxygen is increased, the flame temperature will rise, as will the oxidizing characteristic of the flame, until a maximum temperature of 5,300 F is achieved. This adjustment yields maximum efficiency of the oxypropane preheating flame for the cutting process.

As noted, one volume of acetylene utilizes one volume of cylinder oxygen to achieve maximum flame temperature, whereas propane requires five volumes of oxygen. This does not mean that five times as much oxygen is required in the oxypropane preheat; it means that three volumes will be required because propane has a heat value of nominally 5/3 the number of BTUs per cubic foot of acetylene.

Therefore, to liberate the same volume of usable heat will require the reciprocal, or 3/5 cu ft of propane.

When we say "usable," we must take into consideration that the theoretical neutral flame temperature of the oxyacetylene flame is 6,300 F, whereas measurable temperature varies from 5,600 to 5,800 F.

This is accounted for by the high luminosity of the oxyacetylene flame, much of which is lost in spherical radiation and not imparted to the work. The lower luminosity of the oxypropane flame results in less loss of radiant heat.

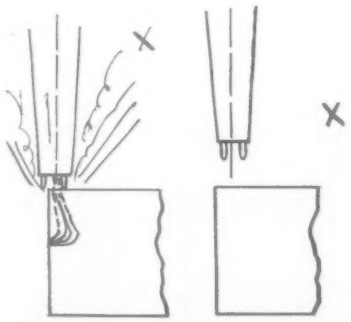
One important handicap in the acceptance of propane for oxyfuel cutting has been the failure of designers to agree on tip designs to most efficiently combust this fuel

Early designers tried to minimize the required volume of oxygen to combust the molecule, thus defeating the purpose. Using three volumes of oxygen per volume of propane produces 4,600 F flame temperature, but requires the other two volumes of oxygen from the atmosphere.

Unfortunately, atmosphere contains nearly four parts inert gases, predominantly nitrogen, which act as "dead headers" in passing through the flame and result in loss of flame temperature.

Designing the tip to utilize completely the total required oxygen from cylinders excludes atmosphere, induces maximum flame temperature of 5,300 F, and produces a bitingly oxidizing set of inner cones which speeds steel ignition temperature.

Since LP gas is relatively slow burning compared with acetylene or hydrogen, special cutting tip designs are required. In general, oxy-LP tips consist of a base for seating the tip in the cutting torch head, into which is inserted a stem, usually brass, with a central drilled hole for the cutting oxygen and with milled slots on the stem's outersurface for the preheat orifices.



Left: failed to start at plate edge; results in blow out, cut loss. Right: tip too far from plate; results in ragged cut and loss of cut.

THE fuel GASES

A swaged copper barrel or sleeve is then placed over the stem. Being about 3/16 to 1/4 in. longer than the stem, it results in a recess or cup being formed on the outer end when assembled. The preheating gases "rub" against the sleeve's inner wall which pilots and stabilizes the combustion.

This special tip is the only addition required to use LP gas with a standard flame cutting outfit. Torch, regulators and hose are the same as for oxyacetylene.

Because of propane's slow burning nature, backfiring, preignition and flashback (common with fast burning acetylene under abusive conditions) are practically impossible. When tips become fouled with slag, cooling the tip and disassembling the external sleeve makes cleaning easy.

Excluding atmospheric oxygen, while requiring the greatest volume of cylinder oxygen, diminishes the required volume of fuel gas. Thus, by increasing the proportion of oxygen, the required volume of fuel to be combusted is diminished and an optimum value obtained.

From this comes a simple economic rule: "If the price of acetylene is high enough, and if the price of oxygen is low enough, in a particular application or location, then the use of oxypropane will be more economical than oxyacetylene in the flame-cutting process." This is virtually without regard to cost of propane itself, since it becomes of small consequence in the total cost of the project.

For example, assume that a particular cutting operation will require 100 cu ft of acetylene in an eight hour day for preheat flame.

(a) Suppose the cost of oxygen is $1.50 per 100 cu ft; the cost of acetylene is $3.00 per 100 cu ft; and the cost of propane is $8.50 per 100 lb cylinder (850 cu ft). Then oxygen would cost 1.5 cents per cubic foot; acetylene, 3 cents and propane 1 cent.

Then, using acetylene: 100 cu ft acetylene at .03 — $3.00; 100 cu ft oxygen at .015 — $1.50; total cost of preheat gases would be $4.50.

Using propane: 60 cu ft propane at .01 — $0.60; 300 cu ft oxygen at .015 — $4.50; total cost of preheat gases would be $5.10.

In this example, the cost of oxyacetylene is less than for oxypropane and therefore, acetylene would be favored on the basis of gas cost alone, and without regard to the finished product and/or operator preference and/or familiarity.

(b) Now assume the same cost for acetylene and propane, but an oxygen cost of $1.00 per 100 cu ft, or .01 per cubic ft. Then using acetylene: 100 cu ft acetylene at .03 — $3.00; 100 cu ft oxygen at .01 — $1.00; total cost of preheating gases would be $4.00.

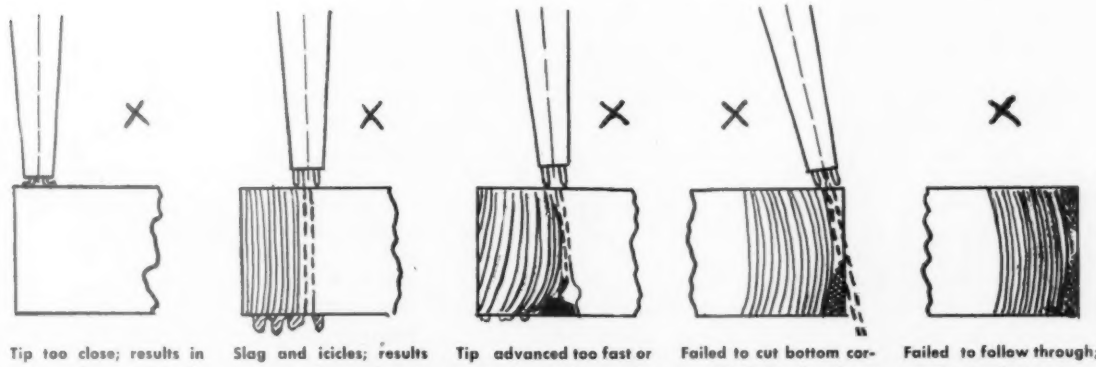
Using propane: 60 cu ft propane at .01 — $0.60; 300 cu ft oxygen at .01 — $3.00; total cost of preheating gases would be $3.60.

In this example, the cost of gases favors the use of oxypropane, again without regard to finished product or operator preference or familiarity. Both examples presume the use of 1:1 oxygen ratio for acetylene and 5:1 for propane.

LP GAS ADVANTAGES

In flame-cutting, the function of the preheat flame is to raise the temperature of steel to its kindling point (cherry red or approximately 1,650 F). At this temperature, steel will burn in

Avoid these flame-cutting errors



Tip too close; results in poor preheat and backfiring.

Slag and icicles; results in too slow advance, too much preheat or insufficient oxygen.

Tip advanced too fast or unsteady torch; results in failure to penetrate.

Failed to cut bottom corner. Failed to slow down at finish to allow kerf to penetrate corner.

Failed to follow through; results in lost cut on both top and bottom corner edges.

an atmosphere of oxygen. Thus, the oxy-LP mixture is satisfactory, despite its lower temperature.

Preheat time required to start the cut will be perhaps two to five seconds longer than with oxyacetylene, depending on whether the start is on the plate edge, inside, or piercing the face of the plate. Another factor affecting starting time is the cleanliness of the surface.

Once the cut has started, the advantages are all in favor of oxypropane. Because of its gentler, lower temperature flame, cut edges are not overheated and a narrower slot of metal is burned away. This action requires less cutting oxygen to remove the lesser volume of steel, or conversely, will allow the same volume of cutting oxygen to more completely oxidize the metal displaced, depending on torch speed.

This minimizes slag adherence to the underside of the kerf, which when present at all, is quite brittle and more easily removed. For the same reason, the lower temperature will not melt cut edges.

The adjustment of any oxyacetylene flame to produce a ratio of 1:1 results in the so-called neutral flame which is immediately recognizable: the amount of oxygen has been progressively increased until no carbon feather remains beyond the end of the incandescent cone. This is not difficult to achieve, provided suitable pressure-reducing regulators are in proper operating condition.

Any additional oxygen volume added to the neutral oxyacetylene flame will result in progressive shortening of the cone until a minimal length is reached At this point further oxygen increase will cause the flame to elongate. In addition, the excess oxygen will have a cooling effect on the incandescent cone.

As the proportion of oxygen increases and the resulting cone shortens, incandescence will diminish and the cone will become pale and watery. This is caused by heat absorption by the free oxygen passing through the cone. The oxygen is unable to combine with the hydrocarbon molecule until it has passed the primary combustion stage and emerges into the outer envelop of the flame.

Thus, the oxyacetylene flame is easily adjusted and the proper adjustment, easily recognized.

If oxypropane flame adjustment were as easy, the fuel might be more popular. However, there are three tests for maximum efficient flame adjustment, that is, to produce the 5:1 ratio.

(a) *Minimum cone length*: Open fuel gas needle valve and ignite the gas, pressing the tip lightly at 45 deg angle against fire brick or metal surface. Turn on oxygen preheat valve slowly; inner cone of the flame will snap back so that combustion starts within the recessed cup of the cutting tip.

Now lift the torch head, gradually increase oxygen volume. The inner cones will become progressively shorter as the supply of oxygen is increased until finally the flames assume the shortest length and thereafter begin to elongate. Proper adjustment (5:1 consumption ratio) is the shortest length of flame cone.

(b) *Water bucket test*: Fill a pail of water to within four inches of the top. Light and adjust torch flame as described in (a). Gently immerse the tip end into the water to about two inches. The flame will burn under water.

If insufficient oxygen is being supplied, then the carbon monoxide, which has not been combusted to carbon dioxide, and the hydrogen, which has not been combusted to water vapor, will burn on the water surface using oxygen from the air. The flame will be pale lavender to pale blue, and resemble the combustion of coke oven gas. Now slowly increase the oxygen adjustment until the gases on the water surface stop burning. This is the proper adjustment.

(c) *Black spots on preheat surface*: Adjust the preheat flame as described in (a). Apply the preheat to clean surface of steel (not on edge). Hold the tip so that ends of flame inner cones just barely touch the surface.

As temperature rises a bright cherry spot will begin to glow on the steel directly under each preheat cone. If oxygen is insufficient, propane is not completely combusted and a small black spot will appear in the center of each preheat spot. Slowly increase the oxygen until the black spots vanish.

The three methods are exact, simple and check each other. You will undoubtedly choose one of the three, but can always reassure yourself by cross-checking with one or both of the others.

hydrogen

Hydrogen has the highest flame propagation speed known, and when mixed with oxygen, its range of flammability extends virtually from 4% to 96%. It is liquefied only under extremely low or cryogenic temperatures and must be stored and transported in containers under high pressure. It is the only one of the fuels which contains no carbon, and hence, its heat value is very low, only 275 BTUs per cubic foot.

Hydrogen resists compression so at 2,000 psi a cylinder equivalent in size to a 220 cu ft oxygen

THE fuel gases

hydrogen

cylinder contains 191 cu ft of hydrogen. The cylinder tare weight is approximately 130 lb and consequently, the ratio of tare weight to cubic feet of stored gas is approximately 2/3 of 1 lb. per cu ft of gas.

Considering hydrogen contains roughly 1/10 the heat value of LP gas and approximately 1/5 the heat value of acetylene, the resulting high transportation costs in terms of BTUs available is a great disadvantage.

Because of its physical characteristics, safety departments in industry place restrictive limitations on hydrogen's use and thus, it is largely limited to chemical processes, atomic hydrogen arc welding, lead lining of chemical containers and in bright annealing furnaces, all of which require a de-oxidizing atmosphere.

However, hydrogen heat does have deep penetration and heavy sections of iron and steel have been cut with hydrogen as the preheat fuel.

natural gas

Natural gas, collected in the oil fields and transmitted under nominally 400 psi, consists predominantly of methane with smaller quantities of ethane, to produce an average heat value of nominally 1,050 BTUs per cubic foot.

To liberate the same volume of heat as one cubic foot of propane will require 2½ cubic feet of natural gas.

Its popularity is restricted by the fact that it must be fed from the pipeline. Under certain circumstances, large transmission lines and injector torch equipment to siphon or aspirate the fuel into mixtures are required because it is normally available under the ultimate transmission pressure used by low pressure burners.

Otherwise, expensive booster equipment or blowers to increase pressure of the fuel for transmission through longer lines would rob this low cost fuel of many of its advantages.

In addition, most ordinances require natural and city gas pipelines to be protected with approved hydraulic water seals or flashback arresters wherever natural or city gas is used with commercial oxygen for combustion purposes. This introduces costly construction problems.

Under controlled tests, it has been fairly well demonstrated that because of its lower BTU value the increased oxygen consumption required to combust the greater volume of natural gas handicaps its ability to compete.

methyl acetylene

Methyl acetylene is a colorless, non-toxic flammable gas at room temperature and pressure. It is readily liquefied and is shipped in that state under its own vapor pressure of about 60 psi at 70 F.

The gas has a triple bond in its composition, thus liberating additional heat of union at combustion. This is also one of the advantages and factors in acetylene's heat value which also carries a triple bond. (*See below.*)

A new fuel gas, said to offer savings of 15 to 45% in oxygen cutting, has been developed by Dow Chemical Co., Midland, Mich.

The gas, called MAPP, is stabilized methyl acetylene combining the high energy characteristics of acetylene with the handling and safety features of propane, according to Dow.

Though the gas belongs to the acetylene family, and is liquefied and handled in regular LPG equipment, it is not a formulated acetylene or propane. Components are methylacetylene, propadiene, propylene and related compounds.

The firm recommends it for all regular metal cutting —particularly powder cutting of stainless, flame-cutting of mild steel, metallizing and brazing.

Flame temperature is still being determined by the Bureau of Mines, although it should be about the same as acetylene's. Heat of combustion is about 20,000 BTUs per pound. Oxygen consumption is about 2.3:1.

According to the company, the gas is safer, faster cutting and more economical than acetylene. It is safety rated the same as propane, and although it costs more than propane, cutting is faster.

Pure methyl acetylene was introduced by Dow about 20 years ago but was limited to specific chemical processes since it was highly explosive and unstable.

EFFECTIVENESS OF PREHEAT FLAMES

Cutting iron and steel in an atmosphere of pure oxygen depends on the simple proposition of raising the metal's temperature to its kindling point (1,650 F). Thus, the effectiveness of the preheat to achieve this temperature is a function of flame temperature and concentration on the one hand, and the condition of the metal receiving surface on the other.

An ideal cutting tip would be one which heats the steel surface only to the ignition point or slightly above, and at the same time limits the heated zone to a width nominally equal to the diameter of the oxygen cutting jet.

If this were possible, the minimum amount of metal would be raised to its burning temperature, and hence, maximum oxidation of the minimal metal to be consumed would be achieved.

However, the fact remains that distribution of the preheat usually combusts too much metal: complete oxidation does not occur; and slag forms.

This undesirable condition is either aggravated or minimized by a wide variety of contributing factors, *e.g.*, tip design; preheat orifice distribution, size and number; tip condition after considerable use; relative pressures of preheat gases; adjustment of oxygen and fuel gas ratios.

Besides these variables, other considerations are the steel's condition, the operator's skill and his ability to advance the torch as rapidly as possible for maximum efficiency.

In Europe designers have favored use of annular preheating orifices in which the preheat flame is actually a continuous cylindrical cone. This principle is highly efficient but very difficult to maintain because of the rapid deterioration of apparatus (*i.e.*, pre-ignition and/or flashback tendency with acetylene) in the hands of operators who may not be conscientious. With LP gas, the required recessed cup design also precludes use of such circular preheats.

SPEED OF FLAME PROPAGATION

The physical properties of different fuel gases include individual limits of flammability when mixed with air or oxygen. Because of inert atmospheric elements, the flammable range of an air-mixed gas will be substantially narrower than one mixed with pure oxygen, where the limits will substantially enlarge.

In addition, speed of propagation of a fuel gas-air mixture will be relatively slow at the extreme lower limits and will progressively increase to an optimum or maximum value Above the optimum value, speed of propagation will again diminish until a minimum velocity is reached at the upper limit of flammability.

For example, consider propane's speed of flame propagation. When mixed with air, its lower limit of flammability is 2.3 parts of propane per 100 parts of propane-air mixture, and the upper limit of flammability is 9.5% propane. Therefore, propane has the narrowest limits of flammability of any fuel gas, and according to some, offers safety advantages not possessed by the other gases.

To produce the mixture of propane in air which will have the maximum rate of flame propagation in a 1-in.-diameter tube requires 4.71% of propane with air, and at this mixture the velocity of the flame will be 2.69 lineal feet per second.

When oxygen is substituted for air, flame propagation speed substantially increases However, the gas is still a "slow burner."

This handicap, peculiar to LP gas and to natural gas to a lesser extent, becomes a virtue since the slow rate of flame propagation makes it difficult to induce backfire, flashback or pre-ignition when the tip is subjected to excessive overheating. This means a lower rate of equipment depreciation and elimination of flashback interruptions.

On the other hand, acetylene, a fast burning fuel, has flammable limits of about 3% to 35% in air. The velocity of flame propagation is greatly increased when mixed with pure oxygen, and at 70 F becomes 330 lineal feet per second in an equal mixture with oxygen in a 1-in. tube.

Hence, oxyacetylene tips must be extremely high copper content alloys to achieve maximum thermal conductivity and to prevent the pre-ignition to which acetylene is susceptible. By the same token, no piloting action as in oxypropane tips is required, only simple orifices, since the gas burns readily at the tip end.

All these characteristics of the various fuel gases contribute to the maze of variables to be considered in selecting the ideal fuel.

The fuel gases available to the metalworking industry for preheating agents in oxy-flame-cutting present a challenge to the designer, the engineer, the buyer, and last, and perhaps most important, the operator.

The operator is responsible for producing an acceptable finish, an attractive article, and one that lends itself to most efficient alignment for welding into a finished fabric.

Thus, efficient cutting equipment and processes to sever various metals, which must later be precisely joined to produce a finished product, are a must.

Reprints of this article may be obtained for 50 cents each while supply lasts.

REFERENCES

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LP Gas Data Book, L-400. Sections 3, 4 and 6; The Bastian-Blessing Company

Matheson Gas Data Book: The Matheson Company, Inc.

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Fuel gas cylinder data

Acetylene Cylinders (Spec.: ICC8AL)

Capacity cu ft	Dimensions, in.				Weight of cylinders & contents, lb			
	OD	Height	Height w/cap	Wall	Empty	Full	Acetone	Acetylene
10	3½	18	20	.09	8¾	9½	1½	¾
40	6¼	21¾	23¾	.10	26½	29½	5½	3
60	6⅞	26½	32½	.11	40¾	45	8½	4¼
70	7	26½	32½	.11	41	46	9	5
115	8	28⅜	34⅛	.11	65	73	15	8
120	8¼	32¼	38¼	.12	66	75	16	9
170	10¼	27⅜	33⅛	.12	87	99	22	12
185	10¼	32	38	.15	93	106	24¾	13
225	12	27	32¾	.15	111	128	30¼	16½
275	12⅜	32¾	38¾	.15	128	148	37½	20
300	12⅜	36	42	.15	156	178	41½	21½
340	12⅜	37⅛	42⅞	.15	163	187	45½	24
350	12⅜	41	47	.15	165	190	47	25
1000	20	38	43	.17	395	465	136	70

Note: Cylinder weights and measurements may vary from these nominal figures among different manufacturers.

Propane and Butane Cylinders (Spec.: ICCB240)*

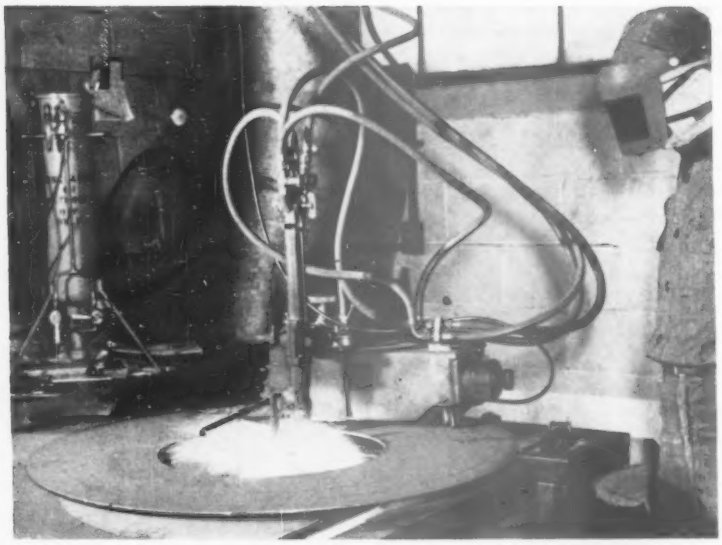
Capacity, lb			Empty weight	OD	Height	Height w/cap
Propane	Butane	Water				
20†	24	48	18½	12	15¾	20⅞
25	30	60	24½	12	18⅞	24
40	48	96	36	12	27⅛	32¼
50	60	120	42	12	34⅛	39¼
60†	72	144	47	12	39½	44⅜
100†	119	239	67	14½	45⅜	50½
150	179	359	109	20	37¾	42⅞
200	239	478	135	22	41	46⅛

*Removable-cap cylinders. †Available in several different cylinder weights.

Fuel gases and their properties

GAS	FORMULA	TRANSPORTED STATE	CYLINDER SIZE (Most Popular)	CU FT PER CYLINDER	CHARGING PSI @ 60 F	BTUs PER CU FT	FLAME TEMP.
Acetylene	C_2H_2	Dissolved in acetone under pressure (1)	12" by 38"	275	250	1475	6300 F
Propane	C_3H_8	Liquid under pressure	100 lb 60 lb	850 510	100 100	2520	5300 F
Hydrogen	H_2	Compressed gas	9" by 51"	191	2015	275	5400 F
Natural Gas	CH_4 and H_2 mixed	Pipeline (2)	—	—	—	1050	5025 F

(1) Also generated at up to 15 psi transmission pressure. (2) Available compressed to 2015 psi in cylinders.



COMPONENTS for cryogenic piping are cut by iron powder. Dry hydrogen is used to force powder into the flame and protect connection from burnback.

USING stainless steel filler wire, mild steel manifold assemblies are Tig welded.

Tig-welded piping curbs high liquid-fuel waste

ASTONISHING IS THE WORD to describe the amount of liquid fuel that has been wasted in the missile and rocket industry. But with the help of Tig and Mig welding, flexible fuel-transfer systems have cut this waste drastically.

With previous piping systems, eight or more gallons of liquid fuel could be lost for each gallon delivered to space vehicles at the launching site — a waste of 89% of the fuel before the vehicle even left the ground.

Through the development of Tig and Mig welded vacuum-insulated cryogenic lines, Consolidated Vacuum Corp., Rochester, N. Y., has greatly minimized this waste.

Principally, the cryogenic line consists of a pipe within a pipe with a vacuum between to reduce chill-down time and cut boil-off loss. (Heat transfer loss can be reduced to as low as 1.8 BTUs/ft/hr, depending on the system used.)

To prevent seasonal cracking due to thermal shock, all tubing in the line is made of 340 stainless steel which provides better heat transfer. The inner bearing tube further reduces radiant heat transfer from the outer shell.

Using welding and cutting equipment manufactured by Air Reduction Sales Co., New York City, fabrication of the line begins with iron-powder cutting of pipe components. Stock stainless steel is cut to size by an oxyacetylene flame which has iron power fed into it by dry nitrogen.

Most of the cryogenic system is then Tig welded. Vacuum pump assemblies are welded on a jig which rotates the entire assembly. During the operation, the weldor holds the Tig torch in one position while the assembly rotates on the jig. The mild steel manifold assembly is also Tig welded with stainless steel filler rod.

A Mig welder is used to weld the flanges for the stainless steel piping.

The entire system is vacuum tight. Before leaving the plant, the inner line is evacuated and leak-checked with a helium-sensitive mass spectrometer before it is assembled with the outer line.

After this leak-check, inner and outer lines are assembled so they are concentric to each other. Next, the inner line is pressurized to 150 psi with a mixture of dry hydrogen and helium.

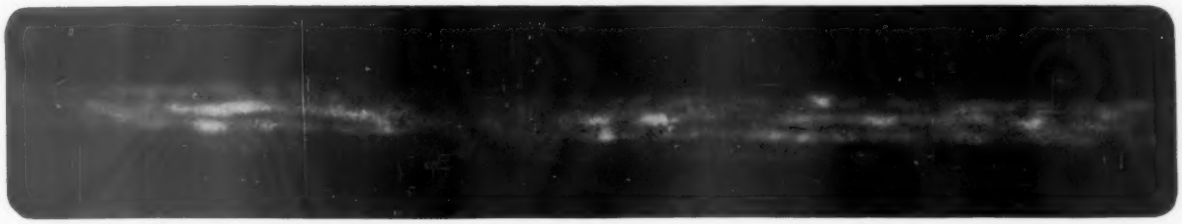
Each joint, both welded and flanged, is then enclosed in a bag containing helium.

Finally, the jacket area between the inner and outer lines is evacuated and checked with a leak detector of the type used to check the inner line. The leak rate must be 1 by 10^{-5} atmosphere cc/sec or less for a section to be acceptable.

For "X" months under the sea—

every weld must be sound

By use of radiography defective welds are detected and corrective measures can then be taken.



To make sure, Electric Boat, division of General Dynamics Corporation, checks every weld by radiography, using Kodak Industrial X-ray Film, Type AA.

The welded hulls of today's nuclear subs contain a maze of intricate piping, machinery, controls and equipment—much of it welded. Radiography of these welds has helped Electric Boat of Groton, Conn., pile up phenomenal records of dependable performance.

At Electric Boat, every weld that radiography shows to be less than perfect is repaired or replaced. It is the only way to be sure that superb performance will not be marred by a "weak link."

Radiography is a great protector of quality. It can assure the welder and the foundryman that only good work leaves the shop.

If you would like to learn more about radiography in terms of what it can do in your own business, talk it over with an X-ray dealer or write us to have a Kodak Technical Representative call.

Now in the new Ready Pack—Kodak Industrial X-ray Film, Type AA and Type M.

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TRADE MARK

a special report

Russian welding: progress and goals

As our October editorial pointed out, Russia is making great advances in welding technology.

According to B. Y. Paton of the Ukranian Academy of Sciences, the Soviet Union is ahead of all other European nations and even ahead of the United States in some respects — welding with fluxes and electroslag welding.

While it is obvious that the USSR is stepping up its efforts to mechanize and automate welding, it is equally obvious that we should not be carried away by Russian claims without examining them.

For example, the Russian magazine, *Automatic Welding*, states that there are more than 12,000 automatic and semiautomatic arc welders and more than 40,000 resistance welders now in operation in the USSR.

According to the same magazine, "this is well above the level to which welding is mechanized in any of the European countries and as regards mechanization of arc welding, we have also outstripped the USA."

Since the United States is presently producing over 80,000 welding machines each year and has been doing so for several years, we can see that Russian claims and comparisons must be taken with a grain of Siberian salt.

Therefore, when *Welding Industry*, another Russian magazine claims that Russia's production output of welded construction will exceed the level of the United States in five years, we need not panic.

We should be concerned, however, because there is no doubt about the Russians' desire to move ahead quickly in welding technology. According to a recent article in *Automatic Welding*, "the large scale adoption of advanced welding methods will . . . enable us to gain time in the economic competition with capitalism."

The article specifies that between 1958 and 1965 the annual production of welded structures in Russia is to be doubled, and the level of mechanized welding is to be quadrupled.

Since, according to the Russians, 7.5 million tons of welded construction were produced in the USSR in 1959, by 1965 Russia expects to be producing about 15 million tons of welded construction.

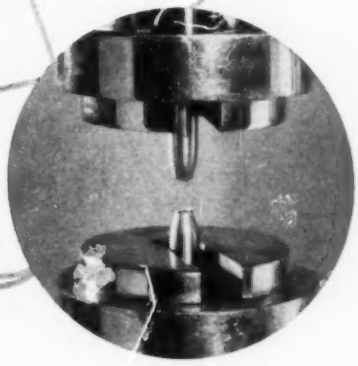
> **"The large scale adoption of advanced welding methods will be a major step towards accelerating construction in the industrial, power, and transportation fields; it will enable us to gain time in the economic competition with capitalism, thereby successfully accomplishing the tremendous tasks posed by the 21st Congress of the Central Committee of the Communist Party of the Soviet Union." — *Automatic Welding*, a Russian magazine.**

The Russians also expect a 400% increase in the organization of large scale electrode production shops and construction of flux manufacturing works. In addition, production of electrode wires and shielding gases is to be greatly increased and more equipment for gas welding produced.

While planning for the future, Russia is not neglecting welded construction in the present. A variety of recent welding achievements were reported at the All-Union Scientific-Technical Conference on welding achievements held in Kiev in November 1960 and the Oblast Conference in Gor'kiy in January 1961.

THE TOUCH OF EXPERIENCE

IN WELDING RESEARCH



Experimentation, by specialists in welding electrode development ■ researchers . . . technicians / mixing, extruding, welding and testing in a never ending cycle ■ combining elements to be alloyed in the welding arc to give you the filler metal for tomorrow's welding needs ■ to improve the quality of today's filler metal ■ Experience is the vital ingredient that imparts quality and dependability—these are characteristics of every Alloy Rods Company welding product ■

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YORK, PENNSYLVANIA

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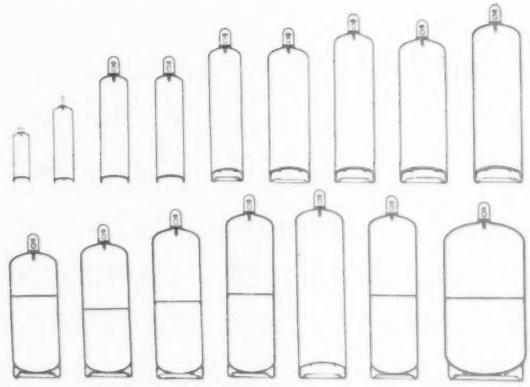
The **more** gas you can put into an acetylene cylinder the **fewer** times you will need to **refill, handle, truck** and do **administrative work** on the cylinder. Coyne cylinders, with their special high-porosity filler, capable of absorbing **30% more** gas than the average filler, bring you bigger profits by **reducing overhead.** And you get this extra gas space in every one of the sixteen Coyne cylinders including the "Coyne 1,000"— the biggest cylinder of the industry — designed for manifold accounts and for pairing with liquid oxygen cylinders.



COYNE cylinder company

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● At the Krasnoye Sormovo plant, for example, extensive electroslag welding of steel and argon arc welding of aluminum alloys is being done, and "Sputnik", a 300-berth diesel ship with hydrofoils, is being fabricated.

● In manufacturing the Volga automobile at the Gor'kiy Motor Vehicle Plant, CO_2-shielded semiautomatic spot welding has reportedly improved chassis quality, reduced buckling, and doubled and tripled output. The inclusion of new welding techniques has reportedly reduced the labor involved to 41 man hours for each "unwieldy chassis."

● At the Leningrad metal works, castings are being replaced by welded structures in seven large turbine components for two hydroelectric power stations. This has meant savings of 2,000 tons of metal and 40,000 machine hours on mechanical treatment.

● Cast bogie frames for electric locomotives have been replaced by welded units at the Novocherkassk electric locomotive works. Welding has reduced the weight of these bogies from 28 to 8.4 tons each.

● A metal works in the Ukraine reduced its consumption of rolling mill rolls by 13,000 tons in 1960 by mechanizing hardfacing.

● At the Zhadanov heavy engineering works, a continuous production line has been set up for welding aluminum tanks. According to the Russians, the line cut labor costs in half and allowed production of 3.6 times as many tanks in the first five months of 1960 as in all of 1959.

In the area of practical research, the Russians also reported:

1—A method for semiautomation of bare electrode arc welding in which a powder rod, containing slag and gaseous substances and requiring no added protection, is introduced.

2—Operation of a highly-mechanized production line being used to manufacture welded H-beams. Main welds are made by an automatic three-arc welder at the rate of 65 ipm and the line can produce five H-beams an hour.

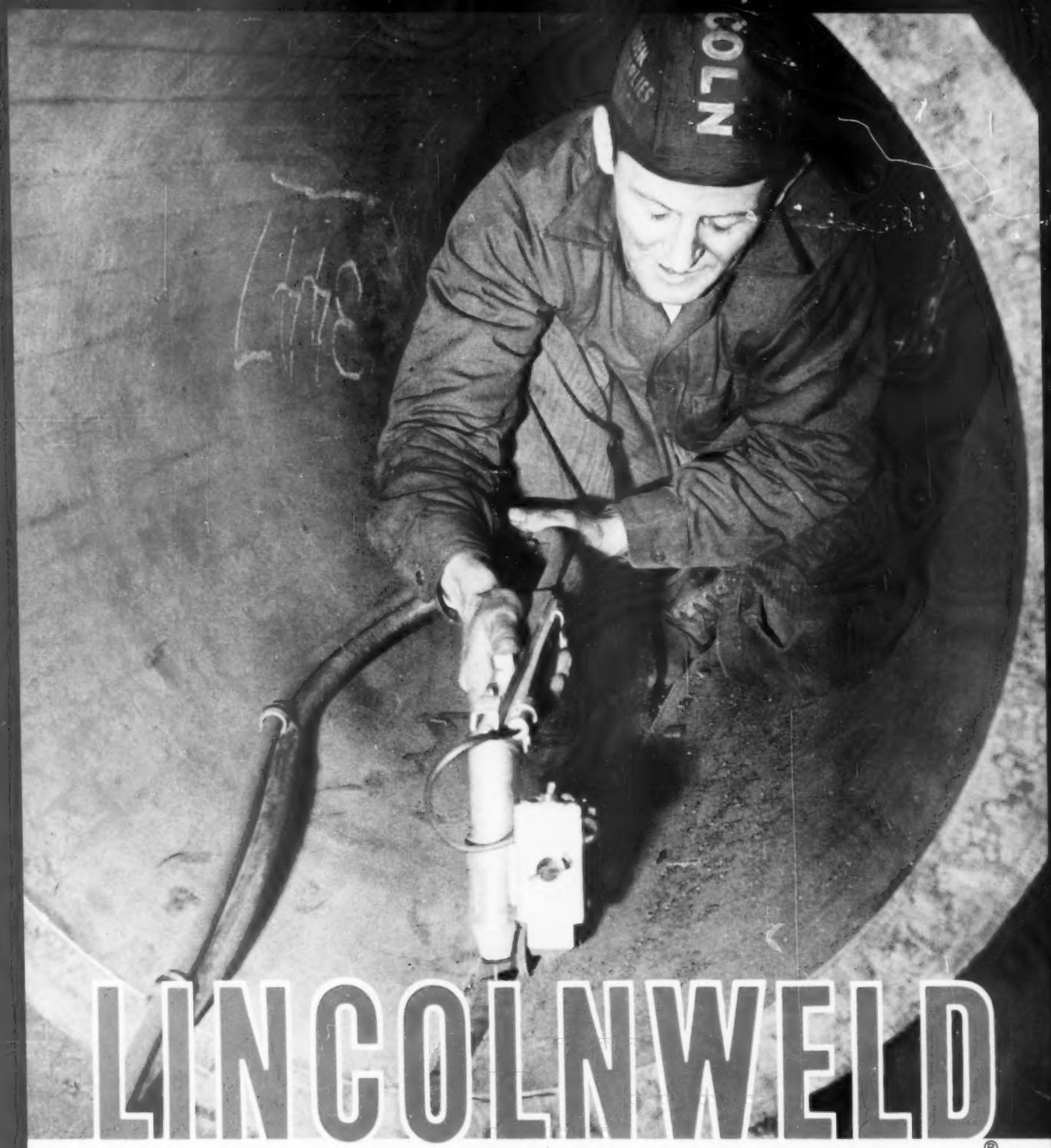
3—Development of a new type of heat exchanger surface which has already saved 340 km of alloy steel tubing in the fabrication of a single 50,000 kw gas turbine.

In spite of these accomplishments, however, the Russians do have major welding industry problems —problems which they readily admit.

Soviet production of welding equipment and materials is far behind the rate of increase in welding production. Demands for welding equipment made by industry are only half satisfied.

In addition, Russia's capacity for producing covered electrodes and alloy electrode wires is only slowly increasing and demand greatly exceeds supply.

Whatever the merits of Soviet claims may be, and whatever the problems the Russian's face, one conclusion is definite—Russia is stepping up its efforts to mechanize and automate welding and challenge the United States as world leader in welding technology.



Dilemma! What do you do when complex parts or short production runs limit you to a manual welding process . . . yet where your product's design and end use clearly require deep penetration and X-ray quality welds at highest speeds? Solution. Use **Manual Lincolnweld** submerged arc welders. The next few pages show how your competitors put these to profitable use. Want to see how? Turn the page.

These are MANUAL LINCOLNWELD "Squirt"® welders on the job

Operator welding this heavy machine base demonstrates versatility of ML-2 equipment. This process is particularly outstanding for getting high speeds and deep penetration on positioned fillet welds. Many use ML-2 as hand-held process but with work revolving beneath the gun on rotating, turntable positioner.

Continuous ¼-inch fillet welds in this hopper are made with ML-3 equipment at the rate of 32 inches a minute. Serrated wheel resting on work drives the gun at pre-set speeds. Flux and wire are fed into work at pre-determined rates. You get degree of control over finished welds simply not attainable by hand methods.

What does submerged arc welding have that manual welding doesn't? Basically, this. You can use much higher currents which result in proportionately higher deposition rates. These, in turn, result in higher production speeds, lower costs. Fewer pre-weld operations such as plate beveling are needed, and less metal is needed in the joint because of its inherent high penetration. Because welding current and arc length are both controlled automatically, you get consistently fine welds time after time. And, with the weld totally enveloped in flux, there simply is no spatter. Result? Better-looking welds that require few, if any, post-welding operations. All these factors translate into a long-term ability to produce quality products, at higher speeds, with lower costs.

LINCOLN WELDERS

Lincoln makes two models of "Squirt" Welders for hand-held submerged arc welding. One is the ML-2, the other, the ML-3. Both units have continuous wire feed and use granular flux. Essential difference between the two is that the ML-2 holds enough flux in its gun for about 10 feet of weld, while the ML-3 has flux fed through a tube to the gun and so can weld indefinitely without stopping. In addition, the ML-3 gun can be equipped with small travel unit having a serrated wheel which drives the gun at pre-set speeds along the work. This removes travel speed as an operational variable and leaves only directional guidance up to the operator. Both can be used in conjunction with either positioners or simple fixtures in order to remove that last variable, direction control.

Lincolnweld "Squirt" Welders can be utilized to do a variety of jobs whether used as completely manual equipment or in highly automated and fixtured set-ups. And, because you have relatively low initial capital investment, you are not committed to any particular type of production, process or product. In other words, your production lines can stay flexible, adaptable to changing product needs.

Contact your nearest Lincoln field engineer . . . a specialist in welding. Let him show you how you can put this flexible, versatile equipment to work increasing production and quality in your plant, shop or factory. Why not do it now?

Here, compact ML-2 gun fits into confined areas inaccessible to full-automatic equipment. While this process is not as fast as the full-automatic, it is considerably lower in installation costs; but most important, it is faster and more economical than stick welding where you require deep penetration at highest speeds.

Custom welding tasks such as this can be done best with ML-2 equipment fitted with new continuous flux feed attachment. As soon as this job is done, equipment can be switched to production of entirely different kind of task. Operators like the submerged arc because there is no flash, no need for headshield. Job is cooler, easier to follow.

Put one of these . . .

MANUAL LINCOLNWELD Submerged Arc Welders to work for you

ML-2 "SQUIRT" WELDER

Total machine consists of wire reel case, control box with wire feed motor, welding gun and necessary cables. Current is supplied by a separate power source. Wire feeding mechanism is governed by a simple voltage control that maintains a constant arc length between electrode and the work by controlling wire feed speed.

Variations in arc length caused by manual handling are compensated for automatically. For more information about ML-2, ask for bulletin 5204.1.

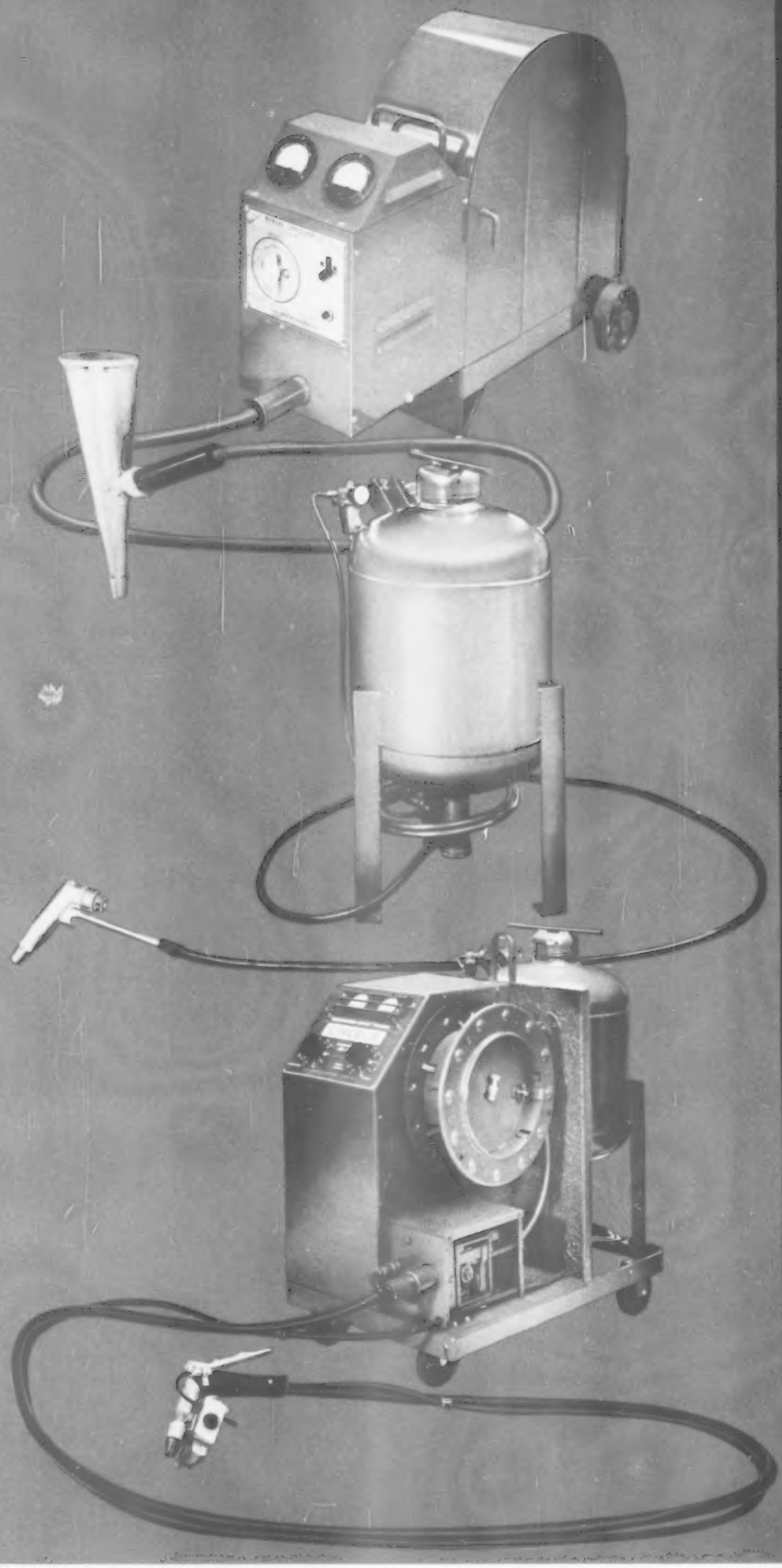
CONTINUOUS FLUX FEED ATTACHMENT FOR ML-2 WELDER

New special welding gun and flux tank provide a continuous flux feed system for ML-2 (or old ML-1) welders. Adds to their versatility, saves time, improves work quality since operator does not have to stop periodically to fill flux hopper. New gun, which fits to ML-2 handle, lets operator get into confined areas easier and at same time, keep gun better aligned over the work.

ML-3 "MECHANIZED SQUIRT" WELDER

Unit furnished complete with gun, cables and welder which incorporates wire feed motor, arc voltage and inching speed controls, ammeter and voltmeter which allow precise settings. Gun itself incorporates serrated drive wheel, speed control and travel reversing switch which lets operator weld in either direction according to the dictates of the job. Single press bar and trigger apply welding current, activate travel motor, electrode feed, and flux valve.

FOR MORE INFORMATION on Lincolnweld ML-3 equipment, request bulletin 5205.1 from your local field engineer. Or, if you prefer, write direct to the factory. Your request will be handled by return mail.



THE LINCOLN ELECTRIC COMPANY

The World's Largest Manufacturer of Arc Welding Equipment and Electrodes

DEPARTMENT WW-3112 • CLEVELAND 17, OHIO

LINCOLN ...USA

ENJOYING herself while getting across a message for U. S. Steel was the enviable duty of this pretty miss. Viewers listened on phones to a message telling how USS steels keep American technology and industry "a big jump ahead."

LINCOLN Electric Co. salesmen explain operation of submerged-arc tandem tractor to interested visitors. Many exhibitors felt $2 fee to show for non-ASM members improved quality of attendance.

Welding well represented at Detroit Metal Show

THOUGH REGISTRATION failed to come up to pre-show expectations, the more than 23,000 exhibitors and visitors to the National Metal Show in Detroit's Cobo Hall termed the five-day session an unqualified success. The American Society for Metals sponsored this 43rd annual exposition.

Very much in evidence among the 238 exhibits and the many engineers, metallurgists and shop personnel viewing them were representatives of the welding industry.

Industry "giants" as well as smaller firms displayed a variety of equipment. Among them were Linde Co., Lincoln Electric Co., Hobart Bros. Co., Gregory Industries, Inc., Merrill Bros., Tempil Corp. and Aerobraze Corp., to name but a few.

Semi- and fully automatic processes and equipment were stressed in most exhibits. American Machine and Foundry Co. demonstrated a new friction welding machine for production use. Linde Co. displayed its "Plasmarc" unit for weld surfacing. In the Hobart booth, a continuous-wire automatic welder was featured, and A. O. Smith Corp.'s welding products division demonstrated several machines of the type requiring the attention of semi-skilled workers.

Elected new president of ASM for the coming year was Carl E. Swartz of Hinsdale, Ill., a consultant in metallurgy and materials. Robert J. Raudebaugh of International Nickel Co. was elected vice president; new treasurer is Joseph G. Jackson.

On October 29, 1962, ASM will return to New York City for the first time in 28 years to host a World Metal Show. Requests for space already received indicate that more than 400 companies will exhibit at this international exposition, according to ASM officials.

POPULAR demonstrations of CO_2 welding were conducted regularly in the A. O. Smith booth. Note "backdrop" of Smith welders, many of which were sold off floor.

METAL SHOW visitors crowd around Linde Co. booth to witness weld surfacing demonstration utilizing "Plasmarc" process, which uses argon to form plasma and shield the surfaced area. The process deposits thin, fully-fused overlays of wear- and corrosion-resistant alloys.

"Bull-doze the big beads you can't beat

For every type of weld-grinding job there is, Bay State has a wheel that's engineered to do it with maximum efficiency. You name it, we've got it!

That's why more weld-grinders have used more Bay State raised hub disc-wheels than any other brand ever since Bay State pioneered with the original product. Bay State still outsells all competition because Bay State wheels *outperform* the competition in durability and *true* economy.

Proof is easy to get. Call in your Bay State distributor or direct representative and let him specify the exact wheels you need for *your* operations...and demonstrate them, too. *Better grinding at lower cost... that is our business.*

KOOLIE HAT—New shape cuts operator fatigue. R grade up to 5200 rpm, U grade over 5200 rpm.

SAF-T-CUT—Longest wheel life when grinding rough surfaces. Excellent for grinding in deep joints.

or blend with a feather-cut . . . these wheels for any job!"

NEW READYMOUNT—Integral with wheel so wheel screws directly onto grinder shaft. Wheel changes are made in seconds. Discard mount with used wheel. Available on Blue Flash and Koolie Hat lines in 7 x ¼ and 9 x ¼ sizes.

DURACUT—Smoothest cutting action for blending and surfacing.

BAYFLEX—Smooth, controlled cutting action for work where smooth finish is important.

BLUE FLASH—Fastest grinding action, ideal for grinding corner welds. Open face for free cutting.

BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

SPECIAL MONEY-SAVING OFFER!

For Medium Welding & Cutting:

PUROX 130 ONE THIRTY OUTFIT

$148.07 value for only $130.00

YOU SAVE $18.07!

The PUROX "130" meets any shop's medium-range oxy-acetylene needs—on production lines, in garages and repair facilities, on pipe welding jobs, in tool, die, maintenance departments

EASY TO USE—No need to readjust regulators when you switch jobs.

RELIABLE—flame won't sputter or pop, regardless of size, valve-throttle or regulator settings.

The PUROX "130" is lightweight, easily portable, economical to buy and use. Welds up to ⅜", cuts up to 4".

PUROX ONE HUNDRED (100) OUTFIT—*for light welding and cutting!* You pay only $100.00 for a $114.62 value—and save $14.62! Ideal for light-duty production, repair, maintenance work. Use the "100" on aircraft, small parts, light machinery, sheet metal assemblies. Extra small and easily portable (entire unit weighs less than 10 lbs.). Welds up to ⅜", cuts up to 2".

Your LINDE Distributor — *"Where One Call Gets It All"*

Your nearby LINDE distributor has both of these PUROX kits in stock now. For his location, check your Yellow Pages. Or write Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

"Linde," "Purox" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

FIRST solar radiation concentrator model completed by Ryan is shown folded (above), as it would be for missile launching, and deployed (right), as it would be in space.

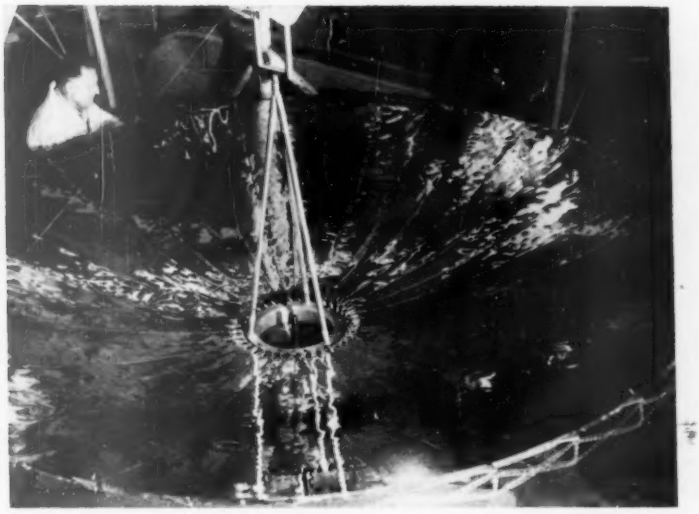
Ryan utilizes thin-skin welds to complete solar mirror

ENGINEERS AT RYAN Aerospace, San Diego, have joined the age-old quest for a means of capturing energy from the sun, the greatest known power source in our solar system.

Adapting design, welding and metallurgical know-how acquired in developing many ultra-lightweight structures, this division of Ryan Aeronautical Co. has entered the field of solar concentrators for space application by constructing a series of mirror models.

The first full-fledged project was recently completed for a company that is developing a large solar mechanical engine. The unique mirror is a 10-ft-diameter metal assembly. This is slightly less than one-fourth the size of the full-scale solar radiation concentrator envisioned for the 15-kw power system for space-vehicle applications.

Consisting of 36 blade sectors, the paraboloid is folded during



boost, and automatically deploys when in orbit. It will then concentrate the sun's rays into the power package for engine operation. When folded between satellite payload and power unit at launching, the concentrator is 28½ in. in diameter and 56 in. long.

Resistance spot welding, a process with which Ryan engineers are extremely familiar, was selected to fabricate mirror blade elements. The petal skin, which had been stretch-formed, was hard-rolled aluminum foil 0.005 in. thick. The lattice structure providing backup for this skin was 0.004-in.-thick material.

Using a squeeze pressure of approximately 3 psi, welds were made with 50-150 watt-seconds of current. The truncated top electrode was precision spring-loaded, and was a special low inertia type for quick pressure application.

Unusual and exacting fixtures were required for the skin-to-lattice spot welding operation. The fixtures were contoured to the petal shape of the skin, and were slotted for lattice elements and for the bottom bar-type electrode. So accurate were the fixtures that no distortion occurred on any component.

The "lattice truss" panel construction was developed by Ryan for a number of reasons, not the least of which was the excellent strength-to-weight ratio it offered. The lattice backup for the mirror skin could also (*1*) be assembled from standardized components; (*2*) adapt to non-uniform loading conditions; (*3*) accurately conform to the double curvature of the mirror surface, and (*4*) permit radiation directly from the back of the mirror surface due to its open-back construction.

Advantages of all-metal construction of solar mirrors also are many. The metal concentrator, unlike one employing organic materials, will resist various effects due to the very low pressures of space environment.

The metal unit can also be deployed and thoroughly checked out on the ground, since deployment does not depend upon pressure- or temperature-sensitive chemical or fluid flow processes.

Since its fuel (sun rays) is mass-less, but the power plant itself is heavy compared to other systems, solar power is attractive only where power is needed for an extended period of time. Ryan's efforts, therefore, are directed toward solar concentrators with useful life expectancies of several years.

The company is also continuing polishing development and reflectivity studies to attain required surface perfection for optimum performance of an evaporated film of aluminum or silver deposited directly on the polished mirror skin.

—your LINDE distributor!

In the business of welding, you'll find a capable partner in your LINDE distributor. He is ready and equipped to give you the fast, efficient, personal service you need. He maintains complete stocks of welding and cutting equipment and gases, welding rods, supplies, and accessories. And since it's his business to help your business, he concentrates on knowing what you want—and having it ready.

More than this, your LINDE distributor is an independent local businessman, familiar with nearby industry and its welding needs. When these needs include expert advice, he's prepared on that score, too. He can also call on LINDE's own technological services for the answers to new, different, or difficult welding problems. More than fifty years of pioneering in welding and cutting stand behind the LINDE brand name; through your LINDE distributor, this background is available to you.

A phone call is all it takes to get in touch with this valuable business partner. Look him up in the classified directory. Or, write for his address to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

Your LINDE Distributor

"Where One Call Gets It All"

LINDE COMPANY UNION CARBIDE

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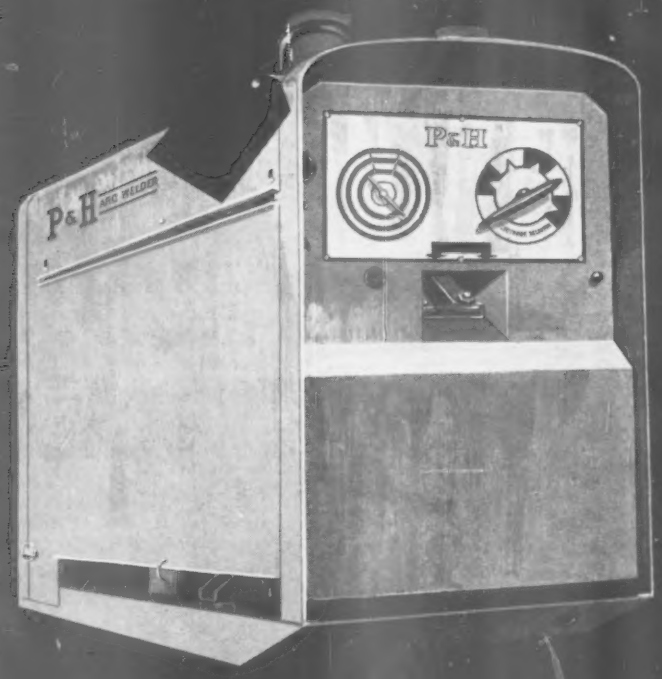
YOU MEN WHO KNOW WELDING

...know what you want in a welder



There are 49 P&H welding machines. WNG-200 is just one of 10 engine-driven models available. Others include AC, DC, AC/DC, and constant-voltage machines, plus time-amperage and punched-tape controls for programmed welding.

...know
what you want in
electrodes

There are 512 P&H electrodes. These include mild steel, alloy steel, cast iron, low-hydrogen, stainless steel, heat-treatable, and hardsurfacing. Available in all standard sizes — by the pound or the car load.

WE BELIEVE WE DO, TOO!

HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
WELDING PRODUCTS DIVISION

Servospeed

HEART OF WELDING AUTOMATION

MODERN ELECTRONIC ENGINEERING GIVES PRECISE POSITIONING SPEED CONTROL

1/100 — 10 H. P.

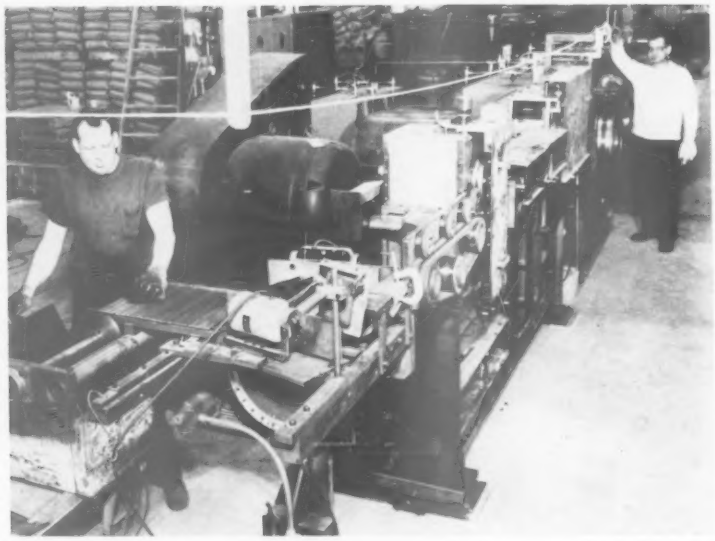
Modern industrial electronic engineering has been coordinated with electric motor design to provide a versatile means for obtaining the full possible advantage of speed control in WELDING POSITIONING EQUIPMENT.

PATENTED FEEDBACK, OR "SERVO" CIRCUITS PROVIDE CONSTANT TORQUE CAPABILITY OVER WIDE SPEED RANGES OF AS HIGH AS 60 TO 1 IN SOME MODELS AND A MINIMUM OF 20 TO 1 IN OTHERS.

Servospeed
DIV. of ELECTRO DEVICES, Inc.
4 Godwin Ave., Paterson, N. J.
ARmory 4-8989

Circle No. 183 on Welding Info-Aid Card

Modernized electrode plant draws wire at 1,200-fpm rate



HOT-ROLLED rod is mechanically descaled, drawn, straightened and cut with this custom-built equipment.

A. O. Smith Corp., Milwaukee, has just completed a $250,000 program to modernize its electrode plant in Leola, Pa.

With the new facilities, the plant has doubled its capacity to include 500 types and sizes of electrodes and has accelerated wire drawing to speeds of more than 1,200 fpm.

Primarily responsible for these new efficiencies and improved quality are: a new high-temperature electrode oven which can bake 12,000 lb of electrodes an hour at temperatures up to 1,000 F, and new wire drawing, straightening and cutting equipment.

With the new facilities, core wire production now proceeds through the following steps:

1 — Butt welding each 600 to 1,200-lb rod coil to the next coil.

2 — Mechanical descaling of the rod.

3 — Cold drawing and reducing of rod in two to five passes.

4 — Straightening of wire on a custom-built frame which employs 24 to 28 rolls, half in the vertical plane, half horizontal.

5 — Cutting wire to required length by carbide cutters on two opposing wheels.

6 — Automatically dropping cut-wire lengths in storage boxes from which they are later automatically fed to the extrusion machines.

Between drawing and baking, electrode coating compositions are selected for different welding applications and weighed before being dry and wet mixed.

Coating batches are then air-evacuated and compressed into cylindrical slugs which are fed to an extrusion press. Coatings are then automatically extruded on the wire to form the electrodes.

After processing electrodes through their particular bake cycles in a two-oven system, electrodes are inspected, weighed in lots and packaged in cartons.

According to Leola plant manager J. W. Beitenmiller, the new additions permit the plant to produce electrodes "faster than any other comparable electrode manufacturing facility."

. . . please turn the page

Unequalled for performance and economy...

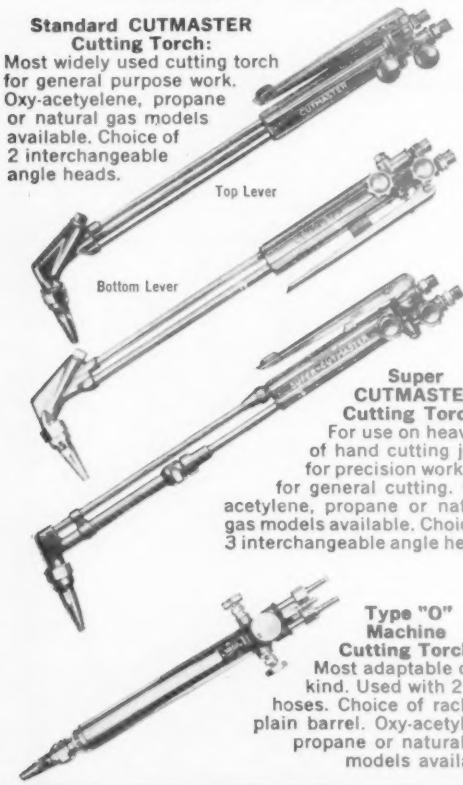
MECO

Welding and Cutting Equipment

MECO equipment has a 50-year record of reliability and superior performance—and it is easier to put back in top working order if repairs are necessary. These operating advantages result from exclusive design features, superior workmanship and years of specialization.

The MECO line is most complete, which enables you to select welding and cutting equipment best suited to your needs. Save time, trouble and get more for your dollar with MECO.

CUTTING TORCHES



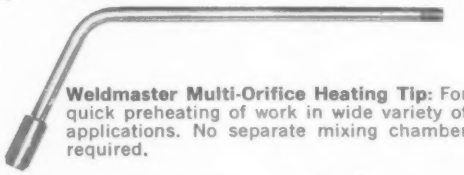
Standard CUTMASTER Cutting Torch: Most widely used cutting torch for general purpose work. Oxy-acetyelene, propane or natural gas models available. Choice of 2 interchangeable angle heads.

Super CUTMASTER Cutting Torch: For use on heaviest of hand cutting jobs, for precision work and for general cutting. Oxy-acetylene, propane or natural gas models available. Choice of 3 interchangeable angle heads.

Type "O" Machine Cutting Torch: Most adaptable of its kind. Used with 2 or 3 hoses. Choice of racks or plain barrel. Oxy-acetylene, propane or natural gas models available.

WELDING TORCHES

Weldmaster Torch: For every welding and heating application. Light in weight, yet rugged.



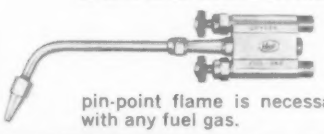
Weldmaster Multi-Orifice Heating Tip: For quick preheating of work in wide variety of applications. No separate mixing chamber required.

Weldmaster Cutting Attachment: Cuts up to 5" thicknesses. Choice of 3 interchangeable angle heads.

Aviator-Jet Torch: For all types of sheet metal welding, particularly adaptable to production line applications.

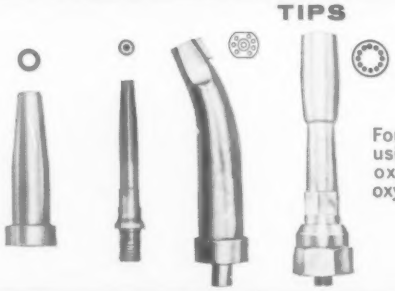
Aviator-Jet Cutting Attachment: Capable of cutting all commercial thicknesses of sheet metal up to 2". Choice of 2 interchangeable angle heads and 5 tip sizes.

Automat Torch: For use where welding is subject to frequent interruptions. Thumb control valve and pilot light enables operator to turn torch on and off without reigniting.



Miget Universal Torch: For use in precision work where a minute, pin-point flame is necessary. Uses oxygen with any fuel gas.

TIPS

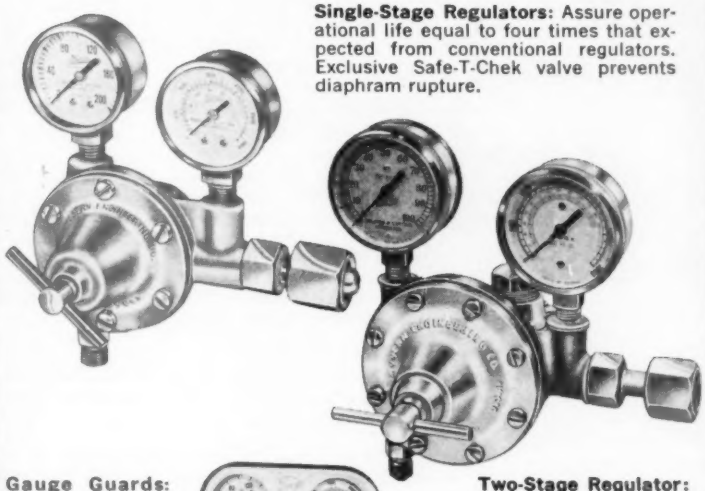


For all types of work using oxy-acetylene, oxy-propane and oxy-natural gases.

50 YEARS SERVICE

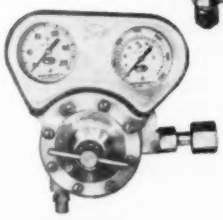
PIONEERING THE DEVELOPMENT OF BETTER EQUIPMENT FOR INDUSTRY SINCE 1911

WELDING AND CUTTING REGULATORS

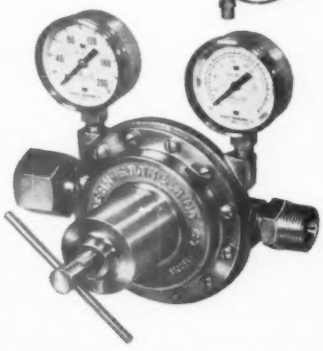


Single-Stage Regulators: Assure operational life equal to four times that expected from conventional regulators. Exclusive Safe-T-Chek valve prevents diaphram rupture.

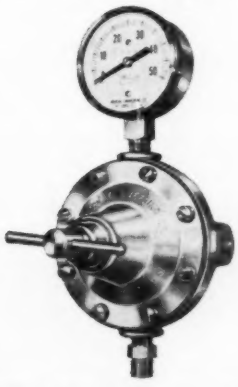
Gauge Guards: Provide maximum protection against gauge damage. Easy to install on single or two-stage regulators.



Two-Stage Regulator: For the many cases where extremely close regulation and uniform flow is required. Exclusive Safe-T-Chek valve prevents diaphragm rupture.



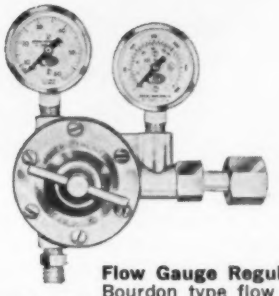
Manifold Regulator: For manifold work where flows up to 4000 CFH are required and for inlet pressures up to 3000 P.S.I. Exclusive Safe-T-Chek valve prevents diaphragm rupture.



Station Regulator: Provides extremely close station regulation on distribution systems of oxygen, hydrogen and fuel gas.

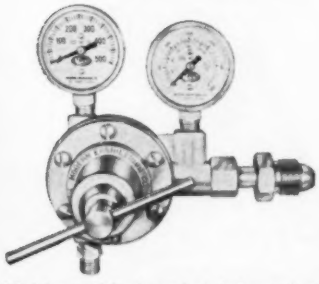
INERT GAS REGULATORS

Flow Meter Regulators: Most rugged flow meter and regulator combination on the market. Exceptionally accurate. Knurled valve at top of column gives finger-tip control from zero to full capacity. Single-stage or two-stage models available.



Flow Gauge Regulators: Bourdon type flow gauge is calibrated to regulator outlet. Single-stage or two-stage models available.

PRESSURE TESTING REGULATOR



Multi-seat block and stainless steel diaphragm assure longer operational life.

LIGHTERS

Tripl-Flint Lighter: Lasts three times longer than conventional lighters.

Tripl-Flint-Lok Safety Lighter: Safest lighter ever made. It cannot accidently spark even when dropped.

JIFFY SOLDERING AND BRAZING EQUIPMENT

Jiffy Torches: For light service work and home use. Air-acetylene or air-propane models available . . . plus full range of tips, a leak detector and soldering coppers.

Jiffy Regulator: Made of machined, extruded aluminum. Acetylene or propane gas models available.

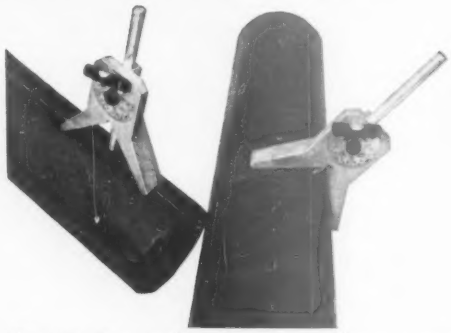
Only a representative selection from the complete MECO line is shown. For more information, see your MECO distributor or write . . .

MODERN ENGINEERING COMPANY
3401-15 PINE BLVD. ST. LOUIS 3, MISSOURI

Meco

CURV-O-MARK

Centering Heads



Actually, it's five tools in one — replaces protractor, centering head, center punch, level and scale. Y-Type head is accurately machined with tangents and tips to serve in centering and aligning. Dial Set Level is marked in 2½ and 10 degree graduations for easy reading Punch is of drill rod, with special point for long service.

Flange Aligning Tool

This self-centering tool makes pipe line construction faster and more accurate. It is quickly adjustable for all type flanges or pipe sizes ranging from 3 to 12 inch diameters. After easy insertion into pipe, Flange Aligning Tool centers itself snugly against the inside pipe diameter and automatically aligns with pipe axis.

Protractor

The ANG-LO-CATOR Protractor is the only measuring device that quickly and accurately determines correct degree of angle on any pipe or structural material, regardless of size. A valuable aid to weldors, structural workers and pipe fitters. Size 4" x 8".

RADIUS MARKER

The Standard Radius Marker folds to pocket size. This sturdy, folding Radius Marker has a span of 24" and easily swings a 48" circle or arc.
The Jumbo Radius Marker is also the folding type, has a span of 48" and easily swings a 96" circle. These tools are precision made of rust proof aluminum dural.
The Standard Radius Marker folded, measures only 9¼" in length, weighing only 8 oz. The Jumbo model, of course, is larger. Both are equipped with special spring washers to maintain accuracy and rigidity for years of service. Pencil holder is made to hold round or flat pencils, soapstone, or steel point.

CONTOUR SALES CORPORATION

1843 E. Compton Boulevard Compton, California

Reprints still available from WE

Reprints of certain articles published in Welding Engineer are still available. A list of these appears below. Reprints may be obtained for 15 cents each, except where otherwise noted. Payment must accompany all orders. For quantity orders, write for special prices. Order by title from: Reprint Editor, Welding Engineer Publications, Inc. Box 28, Morton Grove, Ill.

Design for welding

Basic knowledge required when designing or redesigning for welded construction is detailed and discussed. Sixteen page reprint includes 11 data sheets.

The meaning of weldability

Weldability of carbon steels and alloy steels, as well as some other metals, is discussed. Sixteen page reprint includes three data sheets.

How to weld T-1 steel

Explains how to weld this high-strength low-alloy metal. Includes a data sheet on T-1 mechanical properties.

Fundamentals of oxyacetylene welding

Gives the basic essentials on and primary steps of oxyacetylene welding.

Uses of build-up electrodes

As rebuilding and reclaiming of worn steel parts becomes standard maintenance procedure, build-up electrodes increase in importance. This 2-page reprint lists the qualities necessary for a good build-up material.

A guide to preheat

This 4-page reprint on benefits of preheat includes an engineering data sheet entitled "Recommended preheat for steel alloys."

Acetylene

A 12 page salute to the IAA and acetylene, details the great success of this gas. Includes a history of the IAA and "The Acetylene Journal."

Filler metals for brazing

Brazing filler metals are detailed and each group is analyzed. Includes data sheet on how to select silver brazing alloys.

Explosive welding and forming open another door

A report on one of the newest entries into the welding industry, and how one pioneer company turned theories and practices into realities.

Our modern-day mythology

A rebuttal to some old-wives tales about the hazards of welding fumes, plus safety recommendations for situations where hazards might develop.

Welding the reactive metals

This 12-page reprint describes techniques for Tig welding titanium, zirconium and tantalum. It also gives experimental data on resistance spot welding of tantalum.

Welding 17-4 PH stainless steel

Sound joints can be easily produced in 17-4 PH stainless by proper welding practice. This 4-page reprint details all phases of the procedure.

Non-destructive testing

Four separate articles comprise this 8-page reprint on non-destructive testing: how to interpret radiographs: circumstances and job requirements govern selection of radiation source in inspection; ultrasonic testing; and a program for radiation safety.

(*Continued on page* 68)

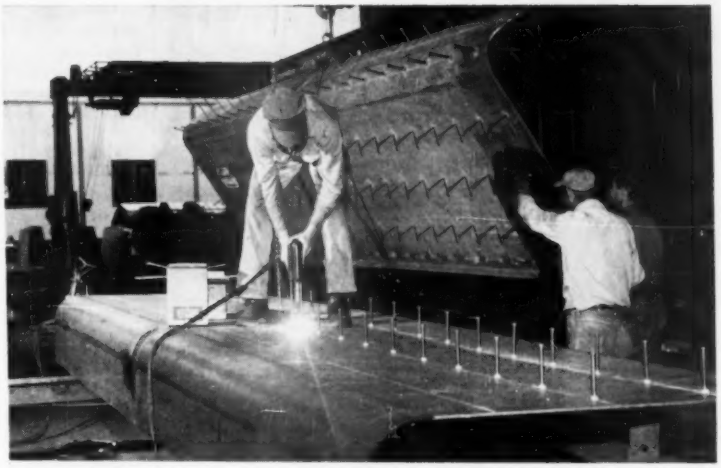
One man makes 10,000 stud welds in a week

To produce U-shaped steel flume liners

ONE MAN RECENTLY stud welded 10,000 headed concrete anchors in a single work week.

The feat was performed during fabrication of U-shaped steel liners for a long flume at Bowaters Carolina Corp., Catawaba, S.C.

The stud-welding gun used in the operation was manufactured by Nelson Stud Welding Div., Lorain, Ohio.



AS soon as one lining section is finished, operator begins stud welding another to achieve total of 10,000 *stud welded anchors in a single week.*

In addition to speed — about three times faster than any alternate type anchor — the end-welded studs gave the added advantage of eliminating distortion. If hand-welded anchors had been used in the 5/16-in-thick steel liner plate, it would have been necessary to straighten the liners.

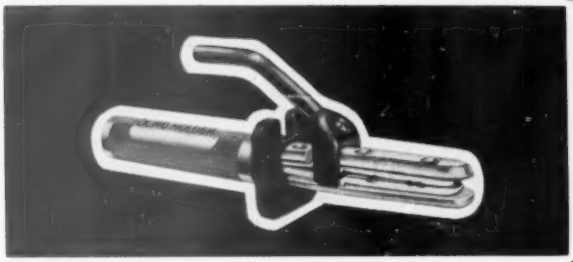
A total of 105 headed concrete anchor studs — 5/8-in. diameter and 5⅛-in. long — were welded to each 20-ft. liner section using two 400-amp motor generators in parallel as the power source.

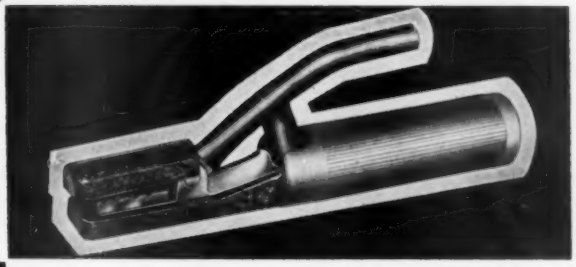
Plates were formed into half U's and rounded ends were temporarily bolted together. Manual metal-arc welding then joined the lining to steel ribs embedded in the concrete trench which holds the flume.

The 1,000-ft.-long flume lining was fabricated by the Kline Iron and Steel Co., Columbia, S.C.

DURO ELECTRODE HOLDERS

THE DURO "STANDARD" ■ THE "ADJUSTABLE TENSION"





- Jaws designed to reach hard to get at places.
- Cool operation—cool handling.
- Fully insulated to protect the operator.
- All parts easily replaced.

For further information and name of nearest distributor write:

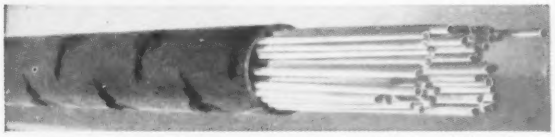
- Easy adjusting of Spring Tension for your requirements.
- New type cable connection prevents fraying of cable.
- Made in Bronze or Light Weight Aluminum models.
- All parts replaceable including copper alloy jaw.

THE DURO ENGINEERING COMPANY

71 Oregon Avenue, Hamden 17, Connecticut

3 METHODS OF PRODUCTION BRAZING ...Which is best for you?

FLUX COATED ROD



A new brazing concept—engineered flux-coated bronze—thick and thin extruded coatings to fit maintenance or production needs.

Work goes fast and even with ALL-STATE's extra thin coated bronze type alloys. Flux is extruded evenly, at thickness of only .0065, to assure excellent control and easy clean-up. Narrow beads are obtained with consistent proportion of flux to rod. Coated rods are highly efficient, require minimum amounts of rod and flux.

BARE ROD AND FLUX

Welding time was cut 25% and clean-up time 75% by using All-State nickel-silver and separate flux when brazing 1" mild steel tubing in power saw frame production.

For the occasional job or where brazing operations change from time to time, ALL-STATE suggests that bare bronze with #41 or #1 flux is the most flexible method, providing maximum control of capillary flow. Recommended for deep joints.

Nickel-silver rod with #11 flux is a versatile combination for joining dissimilar metals. TS up to 80,000 psi.

The bare rod and flux method permits use of special fluxes for unusual applications.

AUTOMATIC FLUXING SYSTEM

World's largest industrial stapling machine manufacturer found solution to assembly problem with high-strength All-State #11 nickel silver and automatic Jet Flux production brazing systems.

The fastest method of surface brazing, and the most economical for production work, is automatic fluxing, available for bronze, copper and steel brazing alloys. ALL-STATE's system permits finger-tip control of liquid flux, is easy to use, requires minimum cleanup.

JET FLUX dispenser, approved by Factory Mutual, is simple to fill, operate, clean, and re-fill. Can be used to feed liquid flux in exact amounts through oxy-gas or air-gas systems. Save on fuel cost by using Liquid Jet Flux with oxy-propane or natural gas stepped up to 8 lb. pressure. Send for free information on how to adapt torch for these lower costing fuels.

ALL-STATE has quality rods and fluxes for all brazing methods. Send for folder on JET FLUX. Also free 56-page Instruction Manual and Catalog.

Distributors everywhere

All-State

ALL-STATE WELDING ALLOYS CO., INC.
White Plains, N.Y. Dial 914 WH 8-4646
QUALITY WITH SERVICE

Reprints continued from page 66

Welding thoriated magnesium

Development of specialized machinery and techniques for joining new magnesium alloys, especially thoriated types, has aided in the production welding of such materials. This 4-page reprint includes tables on mechanical properties and on weld defects and how they affect weld strength.

Instructions for welding moly

Molybdenum has a melting point of 4,730 F, which makes it ideal for high-temperature service in planes, missiles and nuclear reactors. This report gives welding data resulting from six years of experimental work sponsored by the Office of Naval Research. This reprint free.

Effect of arsenic on welds

A study of arsenic's effects on the mechanical properties of welds in mild steel was directed specifically toward a determination of arsenic's role in behavior of welding fittings. Results are revealed in this 4-page reprint.

Stress relieving

Stress relieving can be an important manufacturing operation or a needless expense item. This 4-page reprint is intended to help you in making a correct decision in the matter.

Techniques for torch brazing aluminum

Procedures and techniques for brazing aluminum, are detailed. Includes data sheet on brazability of aluminum alloys plus four tables listing commercial products and their characteristics. This reprint is free.

Determining strength of fillet welds on angles

This 4-page reprint gives the method of determining the correct weld size and length for the most economical strength, joint efficiency, and margin of safety.

How to simplify machine bracket design

This reprint explains the welding advantages of machine bracket design, including diagrams with explanations.

How to get better stainless steel welds

4 page reprint explains the procedures for better stainless welds giving certain basic fundamentals that will spell the difference between success and failure on a job.

Comparative testing confirms oxypropane cutting value

4 page reprint discusses the use of propane as a fuel gas in the oxygen cutting of steel compared to oxyacetylene cutting. Its economic advantages and appearance of workpiece are also discussed.

Induction heating for stress relief

This 4 page reprint explains techniques that can prevent cracks in welded areas through stress relieving. Also includes a chart for computing power and cable length for stress relieving.

How to design for preform brazing

Another 4 page reprint showing how joints properly designed for brazing preforms can help achieve good results. The reprint has 24 figures showing the types of brazing preforms.

Welding heat is chief factor in determining weld quality

Explains the weld heat efficiency of base metal and its importance and how to use it. Includes charts and data sheet.

800 specialists speak at safety congress

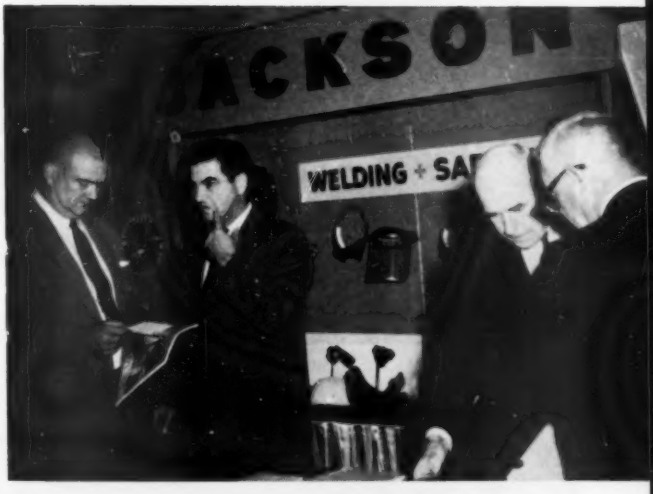
EVERY PHASE of accident prevention was covered at 250 sessions by some 800 safety specialists during the recent National Safety Congress and Exposition in Chicago.

The more than 12,000 persons attending these sessions also visited 188 exhibits, many of which displayed the latest welding safety equipment (*see photos*).

The five-day congress, held in seven downtown hotels, afforded an opportunity for numerous special group meetings, including the National Association of Industrial Glove Distributors.

At the NAIGD meeting, a panel of local manufacturers, discussing automation's effect on total industrial glove consumption, concluded that the glove industry must turn to new markets.

The association is currently conducting a study on cotton work glove standards. (Standards for other glove types will follow.) The goal is to set glove measurements and weights and to simplify existing standards.



ATTENDING the recent meeting of Mechanics Welding Society, Inc., were (left to right) Willard J. White, John E. Bobbin, Harry W. Ebert, Fred C. Sarchet, and Gary R. Frank.

Sarchet tells MWS about nondestructive testing

Fred C. Sarchet, educational committee chairman of the Society for Nondestructive Testing, Inc., was principal speaker at a recent meeting of the Mechanics Welding Society, Inc., New York City.

Forty MWS members attended the meeting at which Sarchet, of Balteau Electric Corp., discussed nondestructive testing.

At another recent MWS Long Island meeting, 20 members heard Jack Donnelly of All-State Welding Alloys Co., Inc., discuss low melting alloys.

McKay shows welder at show in India

One of the displays at the Second Indian Industries Fair held in New Delhi, India, last month was an automatic resurfacing machine made by Automatic Welding Co., a subsidiary of The McKay Co., Pittsburgh.

Twenty-one nations, including the Soviet Union, were represented at the fair.

Acetylene cylinder

SUBMERGED-ARC welding is used to join halves of acetylene cylinder made by Coyne Cylinder Co., South San Francisco. Coyne now offers 16 acetylene cylinder sizes and styles ranging from 10-cu-ft to 960-cu-ft capacity. The "jumbo 1000" cylinder, shown above, is designed for manifold accounts and for pairing with liquid oxygen cylinders.

Puricellios buy Chase Welding Co.

Charles and W. J. Puricellio have purchased the Chase Welding Supply Co., Benton, Ill.

Ralph Chase, a past president of NWSA, and his wife have operated Chase Welding since 1938.

SHORT ARC

NEW . . . COMPLETE *SIGMA* SWM-14 OUTFIT AT A LOW PACKAGE PRICE—$1,475

LINDE's all-new SIGMA SWM-14 Short Arc package . . . *all the equipment you need* for welding thin-wall pipe, tubular structural members, all thin-gauge metals—without burnthrough. Short Arc welding uses tiny drops of metal, not a spray. Tolerates 100% gaps. All-position welding with uniform burnoff rate, pinpoint heat control, minimum distortion.

The SWM-14's only "economy" is its price—$1,475. All parts are heavy-duty and readily accessible. *Compare what you get:*

- Compact, detachable wire-feed control unit—with centrifugal governor—swivel-mounted on power supply.
- 200-amp power supply (100% duty cycle) with variable voltage and inductance.
- 14-oz., 200-amp, air-cooled torch for .030-, .035- and .045-in. diameter wires.
- Shielding gas regulator-flowmeter.
- 10 ft. of argon, wire-feed, and power lines.

For complete details . . . and a "live" demonstration . . . contact your local LINDE office or write direct.

LINDE COMPANY
Division of Union Carbide Corporation
270 Park Avenue, New York 17, New York

UNION CARBIDE

For more facts Circle No. 188 on Welding Info-Aid Card

For more facts Circle No. 189 on Welding Info-Aid Card →

There **is** better service available in CO_2

LIQUID CO_2 Prompt and reliable CO_2 delivery is only part of the service ThermIce offers you. Each ThermIce trailer is designed to serve as an emergency standby CO_2 tank, should your own equipment or supply source fail you. Every trailer carries its own generator and pumps and can supply either liquid or vapor CO_2 directly into your process line.

DRY ICE The large fleet of new and modern ThermIce trucks at every depot assures prompt service, especially for those unscheduled "emergency" requirements caused by sudden weather changes or public utility failures. • ThermIce trucks carry extra heavy insulation to minimize sublimation. ThermIce dry ice is delivered to you at maximum size, with clean, square edges, eliminating waste in repackaging operations. • ThermIce offers *reliable* dry ice service. Every depot manager is a specialist in routing and scheduling delivery to meet your particular needs.

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Baltimore—PEabody 2-3550
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Chicago—KEnwood 6-2244

Cleveland—VUlcan 3-4166
Cincinnati—621-9605
Detroit—VInewood 2-8868
St. Louis—PRospect 6-0860

In Summary . . .

Willson Products, Division of Ray-O-Vac Co., Reading, Pa., recently held a one-week distributor training course for 19 men. Thirteen of these men were from Central and South American countries . . . The Denver district office and warehouse of **The Gevaert Co. of America, Inc.,** has been moved to 5225 E. 38th Ave. . . .

The Yoder Co., Cleveland, has received an order from **Stewarts and Lloyds,** Ltd., Corby, England, for a new continuous electric-weld pipe mill . . . **O. E. Meyer & Sons, Inc.,** an authorized distributor of **Air Reduction Sales Co.,** New York City, has opened a new liquid oxygen storage and conversion station at its main branch in Sandusky, Ohio . . .

Over 100 West Coast welding engineers and metallurgists recently attended a three-day engineering forum on welding fabrication sponsored by **The International Nickel Co., Inc.,** New York City . . . **Linde Co.,** New York City, is now supplying oxygen to **Detroit Steel Corp.'s** Portsmith, Ohio, mill from a new 140-ton-per-day on-site plant . . .

New York Testing Laboratories, Inc., New York City, has successfully coated molybdenum with an alloy-bonded nickel alloy coating. The coating will protect molybdenum at elevated temperatures where it would normally be subjected to severe oxidation corrosion . . . **Welders Supply Co.,** Little Rock, Ark., has expanded its facilities with a 3,600-sq-ft service building . . .

Laclede Steel Co., Madison, Ill., is celebrating its 50th anniversary . . . **Dalweld Co., Inc.,** Mt. Vernon, N.Y., is now processing aluminum welding wire. Facilities include straightening and cutting machines, precision level layer winding machines and triple degreasing tanks . . .

Robvon's Commercial Backing Rings are designed for quick easy alignment of pipe or tubing and assure precise close tolerance fit-up. Robvon Backing Rings allow complete penetration and fusion of the weld. Robvon Backing Rings radiograph perfect certified welds. The patented nubs automatically set the welding gap for the root-pass. The internal bevel and flat inner land assures non-restricted fluid flow.
ROBVON BACKING RINGS APPROVED FOR WELDING PIPE, VALVES AND FITTING JOINTS
ROBVON BACKING RING COMPANY
675 Garden Street
Elizabeth, N. J.
ELizabeth 2-9613
ROBVON also manufactures machined rings to specification. Write for full information.
REG. PAT. NOS. 2,764,426 & 2,366,379

VIPs in review . . .

The Thermacote Co., Pasadena, Calif., has appointed **Joseph S. Valerie** as sales manager of their abrasive division.

Valerie

Brooks

Hobart Bros. Co., Troy, Ohio, has appointed **W. G. Brooks** as staff sales engineer of the Automatic Welding Div. Brooks was formerly with Wolfendon Welding Supplies, Cleveland.

Birdsell Products, Pasadena, Calif., has named two new district sales managers. **Roy Baughman** is the new district manager in the Houston area and **C. O. "Bud" Santos** is district manager in the Los Angeles area.

Graver Tank & Mfg. Co., Chicago, has named **Leslie H. Gilmore** director of trade promotion. **Joseph R. Ford** has been appointed senior welding engineer for the construction department of Graver Tank.

The X-ray department of General Electric Co., Milwaukee, has promoted **Ralph D. Newel** to advertising and sales promotion manager for the medical, industrial and dental X-ray lines.

R. O. Fish has been appointed general superintendent of three departments in the main plant of Harnischfeger Corp., Milwaukee. Fish will be in charge of forging and cut-off, casting prepartations, and sheet metal, fabrication and welding operations and **Stanley G. Wells** has been named manager of the Chicago district office for the Welding Products Div., Harnischfeger Corp.

Wells

Wilcoxson

Leslie S. Wilcoxson,, vice president of The Babcock & Wilcox Co.'s boiler division has been elected chairman of the Welding Research Council - Engineering Foundation. He has been vice chairman of the council for the past three years.

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Your assurance of complete eye protection! Built for Better Service
COVER-SPECTACLE GOGGLES
Soft leather nose pad for protection and comfort.
Large plastic eye cups fit over all prescription glasses.
Screen or ray-proof metal side shields allow adequate ventilation.
Deep lens bezels for easy replacement of lenses.
MODEL 492 GOGGLES
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Dockson CORPORATION
Dockson offers a complete and varied line of low cost, maximum comfort goggles and spectacles for chipping, grinding, welding, and cutting. Their scientific design and outstanding workmanship make them the top choice of industry today.
Write for complete safety catalog.
3839 WABASH AVE • DETROIT 8, MICHIGAN

FOR CONSISTENT QUALITY, WELD WITH ARCOS

Job Report Courtesy of Bonney Floyd Co., Columbus, Ohio

No cutouts in three 4½ inch thick circular submerged arc welds. Fabrication of these boiling water reactor pump housings called for submerged arc welding of two stainless type 18-8 cast sections. After meeting initial side bend test requirements, the 66 passes in *each* casing—from the manual root pass to the last submerged arc pass—met the standard X-ray test for sound weld metal. This is another demonstration of how Arcos quality filler metal products properly used give dependable results time after time.

ARCOS

Arcos Corporation · 1500 S. 50th St. · Philadelphia 43, Pa.

Robert A. Riesman has been named director and executive vice president of the Crescent Co., Inc., Pawtucket, R.I. He has also assumed the post of president of Carol Cable Co.

Alan Wood Steel Co., Conshohocken, Pa., has elected **Robert A. Lubker** as vice president of research and development.

Chemetron Corp., Chicago, has appointed **Roger B. Judkins** personnel director on the corporate staff.

William H. Street, Jr., has been appointed Western district sales manager for Hamilton-Electrona, Inc., New York City. His office will be in Los Angeles.

Street

Marisic

Dr. Milton M. Marisic has been appointed manager of the research and development department in the Liquid Carbonic Div. of General Dynamics, Chicago.

A. M. Andrews, Jr., has been appointed president of Airco Co. International. Andrews replaces **J. G. Bell** who is retiring.

The International Division of Metal & Thermit Corp., New York City, has appointed **Nathan H. Dewing, Jr.,** as a representative.

P. Malcolm Smurthwaite has been appointed manager of Linde Co.'s Oxweld Factory in Newark, N. J. He succeeds **William E. Dwyer** who is retiring after 44 years with Linde.

Robert P. Olsen has opened his own firm, Overlay Engineering Co. located at 7926 Chatfield Ave., Whittier, Calif. The firm will specialize in automatic welding for bimetal manufacturing and equipment recovery. Olsen was formerly a metallurgist for Stoody Co., Whittier, Calif.

Frank L. Brandt has been appointed vice president of the Lynn Div., Thomson Electric Welder Co., Inc., Lynn, Mass.

Brandt

Mitchell

E. A. Mitchell has been elected vice president and general manager of the Martin Electric Div., Thompson Industries, Inc., Detroit. Martin Electric is a manufacturer of resistance welding equipment.

Evans Rule Co., Elizabeth, N.J., has appointed **Worden W. Gentino** as sales manager.

The A. V. de Forest Award given by the Society for Nondestructive Testing has been presented this year to **Richard H. Lambert,** associate director of the metals research laboratory and associate professor of metallurgical engineering at Carnegie Institute of Technology, Pittsburgh. The award was established in 1953 by the Magnaflux Corp. in honor of Alfred V. de Forest, co-founder of the company.

Amperex Electronic Corp., Hicksville, N. Y., has promoted **Charles Roddy** from product manager of transmitting and power tubes to technical assistant to the president. Amperex has named **Al Katz** and **Ed King** assistant product managers.

Alf E. Anderson, Sr., has retired as president of the Albert & J. M. Anderson Mfg. Co., Boston, to become chairman of the board. Succeeding his as president is **Howard W. Smith.**

George E. Sykora has been appointed to the newly created position of manager of standards and quality control of the Instruments Div. of The Budd Co., Philadelphia.

BETTER WELDING THROUGH ARCOS SERVICE

Technical assistance from Arcos will help you get the most economical and efficient application of weld metal. By training and experience, your Arcos representative is the man to bring you on-the-job assistance—when and where you need it—backed up by an Arcos team of technicians, researchers, metallurgists and engineers. Depend on your Arcos representative to supply you with the right filler metal for your job. For better welding call on Arcos technical service.

ARCOS

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For more facts Circle No. 191 on Welding Info-Aid Card

NATIONAL CARBIDE TOPS IN QUALITY!

All you want—when you want it in the **RED DRUM.**
All sizes, in quantities from 2 lb. pkgs. to 5 ton hoppers.

Calcium carbide is a product of:

AIR REDUCTION CHEMICAL & CARBIDE CO.
A Division of Air Reduction Company, Incorporated
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Adaptors
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Y Connections

NEW . . . Special Regulator Adaptors

Oxygen Cylinder (CGA-544)

ITEM NO. 804
(CGA 540-320)
Adapts Standard Oxygen Cylinder to Old Medical Oxygen Regulator.

Old Medical Oxygen O-CO-2 (CGA-320)

Old Medical Oxygen Cylinder (CGA-324)

ITEM NO. 805
(CGA 320-540)
Adapts Old Medical Oxygen Cylinder to Standard Oxygen.

Standard Oxygen Regulator (CGA-541)

Write for Catalog Supplement 61-2

FREE CATALOG
Contains 200 fitting illustrations, prices. Write Dept. E . . .

Your Welding Supply Distributor
SERVES YOU BEST
with WESTERN BRAND Fittings

. . . Because these are *quality* brass fittings manufactured to exacting specifications . . . completely inspected . . . individually packaged to protect quality and coded for easy stocking . . . shipped to distributors on day of order from an inventory of 2,000,000 parts.

"Look for the WESTERN BRAND"

WESTERN ENTERPRISES INC.
Bay Village, Cleveland 40, Ohio
In Canada: Fibre-Metal (Canada) Ltd., Toronto, Ontario

George E. **Christensen** has been appointed manager of specialty sales of Skil Corp., Chicago.

Christensen

Sundmacher

Robert C. Sundmacher has been appointed purchasing agent for the Chicago plant of the Bastian-Blessing Co.

Kenneth A. Matticks has been appointed product manager of stainless flat products with Crucible Steel Co. of America, Pittsburgh.

James D. Stephens has been named manager of the nuclear and special products department of the boiler division of The Babcock & Wilcox Co., Barberton, Ohio. He will be responsible for the design and sale of various products including weldments.

Horace F. Henriques, a retired vice president of Air Reduction Sales Co., New York City, has been appointed executive vice president of the Allergy Foundation of America.

Several appointments have been made in the sales organization of the industrial-automotive division of The Black and Decker Mfg. Co., Towson, Md. New appointments are: **M. D. Moers** to Miami district manager; **P. B. Wayman** to Pittsburgh district manager; **J. R. Steffey** to sales representative in the Dallas district; **G. H. McLain** to Baltimore district sales representative; **B. F. Meyers** to Denver district sales representative; and **A. J. McMillan** to Los Angeles district sales representative; and **Frederick A. Alden** has been appointed purchasing manager of Black and Decker.

Gene A. Powell has joined the Semiconductor Div. of Sytron Co., Homer City Pa., as marketing manager. Powell was formerly district sales manager for General Instruments Corp., Chicago.

Eutectic Welding Alloys Corp., Flushing, N. Y., has selected the first four representatives for its new National Accounts Div. The division will comprise a group of specialists who will devote their entire time to servicing large volume users of the firm's products. The four representatives and their areas are: **Robert Whitney,** greater New York metropolitan area; **John Ryan,** greater Detroit area, **Robert A. Wright,** greater St. Louis area; and **Norman Day,** Southern California.

John D. Nosler has been named manager of manufacturing at Wilkerson Corp., Englewood, Colo. Wilkerson manufactures air filters, regulators and lubricators.

Herbert B. Evans, welding metallurgy specialist for Tenney Engineering, Inc., Union, N.J., has been appointed vice president in charge of manufacturing and engineering of the firm's subsidiary, Harvick Mfg. Corp., South Gate, Calif.

Evans

Oberg

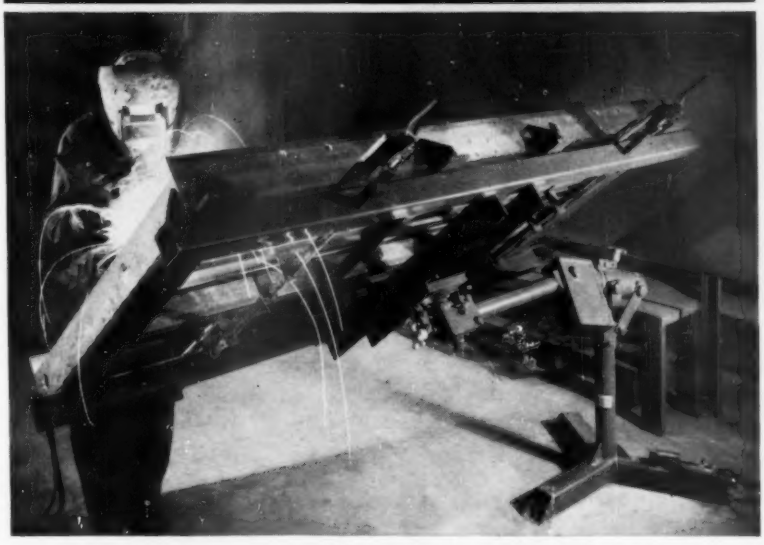
Perdue

Blum

At Metal & Thermit Corp., New York City, **J. L. Oberg** has been appointed vice president in charge of the Minerals, Ceramics and Welding Division. M&T has also appointed **Winston C. Perdue** as technical service engineer for the welding products division. Also at M&T, **Harold P. Blum,** district sales representative for the welding products division in the Cleveland-Akron area, has retired.

For more facts Circle No. 193 on Welding Info-Aid Card

QUICK POSITIONING MEANS GREATER PROFITS



Another Aronson UNIVERSAL BALANCE® Positioner is caught in the act of saving time, labor and money. This one is working for The United Manufacturing Company of Cleveland, Ohio in the fabrication of multipurpose munitions handling trailers for the United States Air Force.

The Air Force sets high standards and rigid delivery dates . . . both met by United Manufacturing Company with the help of Aronson positioners.

Aronson Universal Balance Positioners bring weldments into downhand position quickly and easily, resulting in welds of superior quality and appearance.

Aronson Positioners are designed to give long dependable service . . . the hallmark of all Aronson products.

ARONSON BUILDS THE MOST COMPLETE LINE OF POSITIONERS . . . WITH CAPACITIES RANGING FROM 25 POUNDS TO 600 TONS

Universal Balance® Positioners • Bench Turntable Positioners • Gear Driven Positioners
Headstock-Tailstock Positioners • TracTred® Turning Rolls • Turntables
Fully Automatic Positioners • Geared Elevation Positioners • Magnetic Welding Clamps

Quality PRODUCTS by *Write for detailed engineering data* **Aronson MACHINE COMPANY, INC.** ARCADE, NEW YORK

LINDE ELECTRIC WELDING

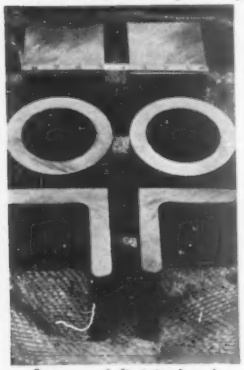
PLASMARC

NEW...THIN, FUSED DEPOSITS WITH CONTROLLED DILUTION
NEW...HIGH-SPEED, DROSS-FREE CUTS IN 5-IN. METALS

FOR MORE DETAILS...SEE PAGE 14 OF THIS ISSUE

WHAT'S YOUR SHOP COST PER HOUR FOR WAGES AND OVERHEAD?

If it's $6.00 you spend 10 cents per minute.
If it's $7.20 you spend 12 cents per minute.



3 cuts - 6 finished ends.

Cuts like these are made in SECONDS!

$6.00 per hour = 1/6 cents per second.

$7.20 per hour = 1/5 cents per second.

WHEN YOU CAN CUT AND FINISH LIKE THIS (Total time 58 seconds) THAT'S FAST! WHY DON'T YOU INVESTIGATE TO SEE WHAT YOU ARE MISSING.

Write and ask about "Cut-Machining."

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APPROVED BY CUSTOMERS, REGULATORY AGENCIES, WORKERS! INCREASES PRODUCTION AS MUCH AS 35%!
Precision engineered to highest standards — ENGWALD's superior exhaust systems have won the endorsement of welding shops, garages, factories and plants . . . and the approval of State and City Labor, Health & Hygiene Depts.
FOR EVERY INDUSTRIAL PURPOSE . . . EVERY SPECIAL JOB — whatever your problems **ENGWALD** can fill your needs. **And ENGWALD units are backed up by many years of experience.**
FREE ENGINEERING SERVICE. Let a skilled Engwald engineer help you in determining your needs and designing a suitable ventilation system for you. Write today for descriptive catalog.

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THE WORLD'S FINEST EXHAUST SYSTEMS
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FRanklin 1-2222

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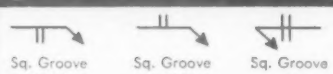
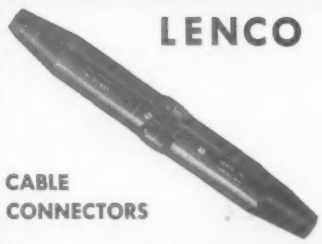
Symbols for Welding



Sq. Groove Weld Arrow Side | Sq. Groove Weld Other Side | Sq. Groove Weld Both Sides

Symbol of Quality

LENCO



CABLE CONNECTORS

Save wear on welding cables. LENCO Cable Connectors let you use just the amount of cable you need for the job. Add on cable—take off cable with ease. Made of high conductivity brass with tough Neoprene covers. Two sizes to fit all sizes of welding cable.

FREE Large 8½x11 chart shows symbols for arc, gas and resistance welding.

WRITE TO:
LENCO, INC.
350 West Adams Jackson, Mo.

Circle No. 197 on Welding Info-Aid Card

Ralph F. Goodwin has been appointed New England district sales manager for Inductotherm Corp., Rancocas, N.J. Goodwin was formerly with Kinney Mfg. Co., Boston.

Warren Stuart, sales manager of Belden Mfg. Co., **Chicago, has** been elected president of the Electronic Industry Show Corp.

DIED . . .

Walter E. Adams, 63, died recently in Guymon, Okla. Mr. Adams, chairman of the board of Adams Hard-Facing Co., Guymon, was a pioneer in the use of hardfacing. He is survived by his widow, a daughter, three sons, 11 grandchildren, and one great-grandchild.

Lewis McDonald, 77, retired vice president of Chicago Bridge & Iron Co., **Chicago, died recently.** Mr. McDonald, a member of the American Welding Society, had been with CB&I for 44 years before his retirement in 1954.

Ken Somers, partner in M.L. Weed & Co., Dallas, died on September 23. Mr. Somers, one of the old-timers of the welding industry, learned the trade as a boy in his father's blacksmith shop. Later he became a salesman for Anti-Borax Compound Co. traveling throughout the country until becoming a partner in M.L. Weed & Co. in 1953. Mr. Somers is survived by his widow, Mildred.

Somers

Peck

Cecil Cressy Peck, 73, founder of the Cecil C. Peck Co. died recently after a long illness. Mr. Peck, who founded the firm in 1935, was a member of the American Welding Society. Until his death, Mr. Peck was president and board chairman of the company which he founded. He is survived by his widow, a daughter, two granddaughters, a sister and a brother.

Book reviews

Compressed Air, Gas Data

COMPRESSED AIR AND GAS HANDBOOK (3rd Edition). Published by the Compressed Air and Gas Institute, 122 E. 42nd St., New York 17, N. Y. Price $8.

This reference covers every phase in the production and use of compressed air and gas. Listed are the general industrial uses for both, and all major industries employing this type of power.

Treated in detail are the numerous compressor types which provide air and gas under pressure. A lengthy chapter is devoted to the object, design and regulation of a compressed air plant, as well as to a study of distribution systems. Pneumatic tools and other air-powered devices are also enumerated and their operation described.

The book is fully illustrated and contains many valuable reference tables.

College Research

ENGINEERING COLLEGE RESEARCH REVIEW, 1961. Published by the Engineering College Research Council of the American Society for Engineering Education, University of Illinois, Urbana, Ill. 10th Edition edited by Paul T. Bryant and John F. Penn. 476 pages. Price $4.

This comprehensive report gives a detailed summary of current research programs being conducted in major engineering colleges throughout the United States.

Research covered in the volume includes mining and metallurgical engineering, mechanical engineering, physics, electrical engineering, and many others.

Addresses and key personnel are also listed.

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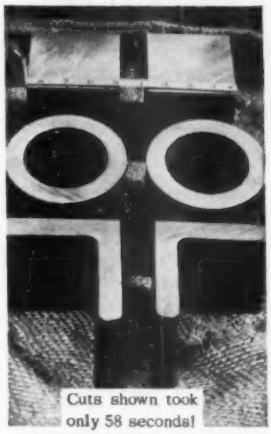

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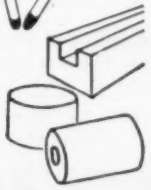

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Metal Analysis

1961 BOOK OF ASTM METHODS FOR CHEMICAL ANALYSIS OF METALS. Published by the American Society for Testing and Materials, 1916 Race St., Philadelphia 3, Pa. 722 pages. Cloth cover. Price $11 ($8.80 for ASTM members)

This volume gives reliable and accurate methods of analysis of metals and is supplemented by many new testing procedures approved by Committee E-3 on Chemical Analysis of Metals.

Some topics covered are: sampling methods, chemical analysis of ferrous and non-ferrous metals, analysis of metal powders, and spectrochemical and microchemical analysis methods.

High-Temperature Brazing

BRAZING FOR HIGH-TEMPERATURE SERVICE. Published by Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. By H. E. Pattee and R. M. Evans. 32 pages. Price $1.

New brazing methods and materials for heat-resistant metal components in aircraft and missile industries are compiled in this publication on brazing.

Russia's Engineers

THE TRAINING, PLACEMENT AND UTILIZATION OF ENGINEERS AND TECHNICIANS IN THE SOVIET UNION. Published by the Engineers Joint Council, 29 W. 39th St., New York 18, N.Y. 112 pages. Price $1.

Based on a tour of the Soviet Union made last year by six representative engineers sponsored by the Engineers Joint Council, this report tells recent achievements, goals and uses of engineering and engineering education in Russia.

Russia annually graduates about 117,000 engineers compared to our 38,000, states the report.

According to the report the Russians are given strong incentives by the government and have a strong sense of patriotism. They also get preferential financial compensation.

One conclusion of the report is that according to United States practice, Soviet engineers and technicians are not used to the fullest degree based on their highly specialized educations.

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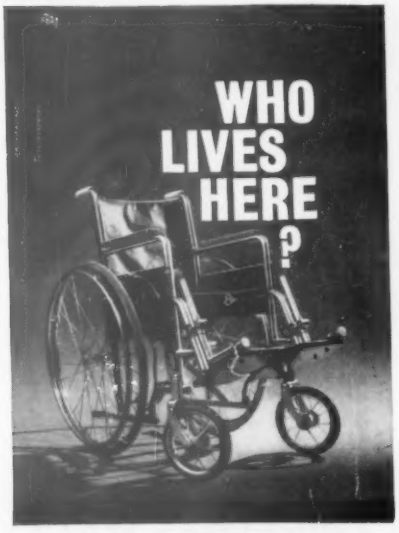

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In retrospect

(Taken from **Welding Engineer** issues of December, 1916, 1931, 1946)

—45 Years Ago—

The Burdett Oxygen Co. will complete its new plant in Pittsburgh about Dec. 15.

As the year draws to a close, we find the welding industry flooded with new business. Practically every manufacturer of welding equipment is working to capacity. There is a growing belief among American businessmen that the end of the war will in no way affect this country's industries inside of five years.

—30 Years Ago—

An industrial conference, held last month at Case School of Applied Science, Cleveland, was attended by about 400 persons. Chairman of the conference was Professor Fred L. Plummer.

The Welding Engineering Co., Bartlesville, Okla., has announced that the name of the company has been changed to H. C. Price, Inc.

—15 Years Ago—

Herman C. Phelps has been appointed west coast regional sales manager for All-State Welding Alloys Co., White Plains, N.Y.

Robert Singleton has been appointed technical advisor to Nelson Sales Corp., Lorain, Ohio.

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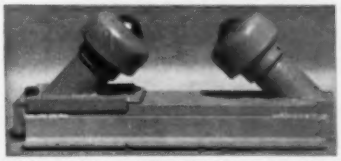

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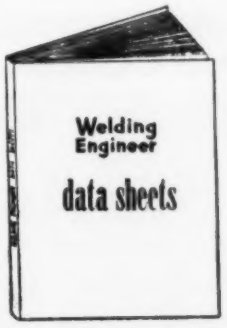

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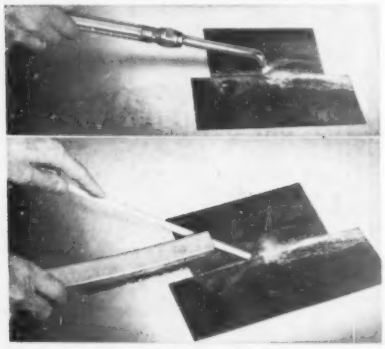

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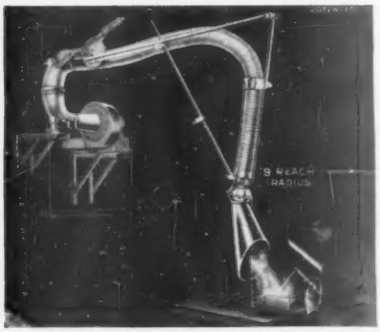

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Ampco Metal, Inc., Milwaukee: Vincent Brass & Aluminum Co., Minneapolis.

Olin Mathieson Chemical Corp., New York City, aluminum mill products: Structural Steel and Forge Co., Salt Lake City.

Rankin Mfg. Co., Alhambra, Calif.: Federal Equipment Eastearn Ltd., Montreal; Interstate Welding Sales Corp., Marinette, Wis.; R & R Welding Supply Co., Rock Island, Ill.; and Southwestern Illinois Supply Co., De Soto, Ill.

United Specialities Inc., El Dorado, Ark.: William W. Allen, Denver; Charles Wheatly Co., Tulsa; L. E. Acker, Oklahoma City; and P. A. Swords, Jr., Chattanooga, Tenn.

Progressive Welder and Machine Co., Pontiac, Mich.; Superior Electronics Co., Minneapolis.

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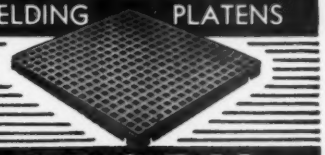

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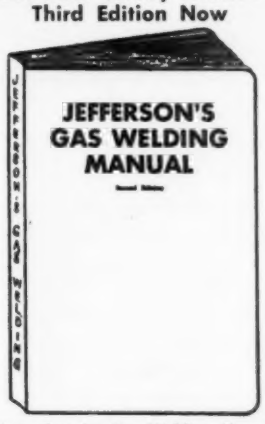

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YOUR 1961 EDITORIAL INDEX

WELDING ENGINEER, Volume 46

January to December, 1961, inclusive

***Editor's Note:** For your convenience, the original titles of all articles appearing in* WELDING ENGINEER *during* 1961 *have been boldfaced. All other entries are cross-references only.*

AUTHORS

Anderson, A. W., Apr., p. 58
Anderson, T., Mar., p. 30
Andrew, S. T., Oct., p. 66
Bach, Harold, Jan., p. 42
Bailey, H. W., Jan., p. 66
Bernard, R. A., Sept., p. 60
Braton, Norman R., Nov., p. 48
Bruckner, W. H., Jan., p. 72
Butzlaff, H. R., Oct., p. 70
Cannizzo, Gregory, Feb., p. 28
Cary, Howard B., June, p. 50
Charter, K. F., Oct., p. 70
Cleveland, Rex, Sept., p. 46; Nov., p. 42
Dawson, Thomas J., Apr., p. 75
Donnelly, John F., Oct., p. 58
Gardiner, Edward W., June, p. 40
Goodwin, Harris A., Feb., p. 34; Dec., p. 37
Greenberg, Simon A., Nov., p. 66
Gunn, Charles A., Apr., p. 48
Hanks, E. E., May, p. 50
Hawes, D. H., Jan., p. 35
Hodska, Nicholas S., Apr., p. 50
Hoefler, R. H., Mar., p. 26; Oct., p. 46
Hurlburt, James, Mar., p. 32
Jackson, Howard E., May, p. 48
Jacob, F. B., Apr., p. 80
James, Cylde, Feb., p. 53
Jefferson, T. B., Mid-June, p. 5; Mid-June, p. 17
Jones, Elda, May, p. 46
Kimmel, E., Jan., p. 40
Little, R. E., Oct., p. 39
May, R. S., Jan., p. 66
Medvin, Robert B., Oct., p. 42
Phillips, Arthur L., Apr., p. 86
Poulson, Jack, Apr., p. 88
Purcell, W., Aug., p. 44
Quigley, M. J., Apr., p. 58
Roeber, Donald, Nov., p. 48
Romine, V. M., Mar., p. 52
Ronay, Bela, Jan., p. 47
Schauweker, G. H., Oct., p. 39
Schumacher, W. G., Aug., p. 40
Schwartzbart, Harry, Mar., p. 27
Sweet, A. W., May, p. 43
Swift, Alden W., Jan., p. 44
Tancula, F. T., Feb., p. 38; Mar., p. 34; June, p. 46; July, p. 44; Sept., p. 39; Nov., p. 52
Trimble, E. L., Mar., p. 30
Twity, W., Aug., p. 44
Wettach, A. M., Mar., p. 46
Zeigler, K. H., May, p. 46

FEATURE ARTICLES

A

Adhesives may solve your bonding problems, Oct., p. 70
A-7 steel is used in welded building frame, May, p. 50
Air Force sponsors symposium on ultrasonic welding, Sept., p. 76
Airport gets welded pipe for plane refueling, Sept., p. 50
All-welded excursion boat to ply the Pacific waters, Mar., p. 60
All-welded tank cars are world's largest, Jan., p. 78
Almost 25,000 attend heating, air conditioning exposition, Apr., p. 92
Aluminum alloy bids for larger share of cryogenic market, July, p. 38
Aluminum boats are Mig welded, Sept., p. 70
Aluminum cylinders are joined by square-butt Mig welding, Jan., p. 75
Aluminum cable eye is Tig welded, Apr., p. 98
Aluminum fuel tanks are Tig welded, Mar., p. 48
Aluminum, nickel steels compete for growing cryogenic market, Feb., p. 38
Aluminum tubing is Tig welded on revolving unit, Aug., p. 44
Aluminum window costs cut with fluxless solder, Feb., p. 53
American laboratory studies practical friction welding, Jan., p. 39
An open letter to management, Apr., p. 54
Are you using proper welding gloves?, Oct., p. 42
Army shipments travel in welded steel containers, Jan., p. 48
Austenitic stainless steel, how to weld it, Nov., p. 66
Auto bodies produced faster with automatic welding, May, p. 64
Auto industry uses more galvanized steel, Sept., p. 42
Automatic arc welding, which process should you use?, June, p. 41
Automatic Mig unit slashes field pipe welding time, Apr., p. 66
Automatic oxygen pressure reducing regulators, Feb., p. 34
Automatic pipeline welding vs. welder, June, p. 46
Automatic welder joins aluminum gas line, May, p. 54
Automatic welding equipment manufacturers listing, June, p. 52
Automatic welding — from tiny transistors to massive forgings, June, p. 44
A welding engineer defends codes as vital to progress, Oct., p. 46
AWS convention held in New York, Apr., p. 43
AWS fall meeting covers metal uses, welding techniques, Nov., p. 56
AWS fall meeting set for Dallas, Sept., p. 68
AWS Welding Show attendance sets new record, June, p. 56

B

Barges are built with help of submerged-arc welding, Jan., p. 66
Basic information on automatic arc welding, June, p. 41
Before hardfacing . . . analyze the job, May, p. 70
Bombs for target practice are welded, Feb., p. 58
Bonding problems may be solved with adhesives, Oct., p. 70
Brazed joints are made simultaneously on chemical reactor, July, p. 60
Brazing, diffusion bonding join copper parts, Feb., p. 46
Brazing fiber metal, Mar., p. 28
Brazing small diameter piping, Jan., p. 44
Brazing stapling machines, Apr., p. 88
Bridge conversion is speeded by welded studs, Mar., p. 52
Bridge costs are reduced by welding, July, p. 42
British electroslag welders speed caisson production, Oct., p. 66
Building frame made with A-7 steel, May, p. 51
Buildings win design awards, Oct., p. 62

C

Caisson production speeded by electroslag welding, Oct., p. 66
Carbide precipitation and sigma phase, Nov., p. 71
Casting repair-welded for less than 3% of replacement cost, Oct., p. 58
Chapel spires are CO_2-Mig welded, Apr., p. 56
Characteristics of welding power sources, Jan., p. 36
Closed-circuit television aids welding instruction, Apr., p. 86
Codes are vital to progress, Oct., p. 46
Cold welding in super vacuum, Nov., p. 41
Columbium-steel pipeline offers weldability, strength, economy, Nov., p. 58
Concrete doorways are cut by powder-lancing, Feb., p. 45
Containers used by the army are welded, Jan., p. 48
Coathanger sculptures with propane torch, solder, Mar., p. 58
Controls, electronic and positioning, for welding, June, p. 40
Control valves are hardfaced, Oct., p. 78
Copper parts are joined by diffusion bonding, brazing, Feb., p. 46
Copper piping in hospital is Tig welded, Nov., p. 62
Costs are cut by the use of positioning, June, p. 37
CO_2 flux-cored process makes 5-ft pass in 80 seconds, Apr., p. 96
CO_2 flux-cored welding fabricates hopper cars, Aug., p. 42
CO_2 flux-cored welding speeds weapons production, Apr., p. 85
CO_2-Mig builds sport karts, Mar., p. 62
CO_2-Mig process cuts costs, man-hours per railroad car, Oct., p. 61
CO_2-Mig welded bombs are "on-target", Feb., p. 58
CO_2 shielding, self fluxing speed heavy equipment fabrication, Mar., p. 38
Cryogenic market bid made by aluminum alloy, July, p. 38
Cryogenic market, nickel steels, aluminum compete for it, Feb., p. 38
Cryogenic pipe is Tig welded, Dec., p. 46
Cryogenics use 9% nickel steel, Apr., p. 46
Cylinders of aluminum are square butt-Mig welded, Jan., p. 75
Cylinders, safe handling procedures for them, Feb., p. 27

D

Dallas to host AWS fall meeting; 17 sessions planned, Sept., p. 68
Degassing tanks are fabricated by steelmaker, Sept., p. 39
Demands are met by oxygen producers with new plants, expanded facilities, Feb., p. 30
Depositing hardfacing alloys, July, p. 40
Design awards won by welded buildings, Oct., p. 62
Design for welding, Mid-June, p. 5
Designing of tubing to promote its use, Nov., p. 42
Designing properly can reduce short span steel bridge costs, July, p. 43
Designing to overcome shrink and draw strains, Apr., p. 50
Designing with standard shapes, Sept., p. 44
Detroit to host 43rd Metal Congress and Exposition, Oct., p. 54
Diffusion bonding, brazing join copper parts, Feb., p. 46
Diodes are joined by weld-wax method, May, p. 43
Distorted structural members are straightened by torch, May, p. 80
Distribution of oxygen, Feb., p. 28
Distribution, production and uses of oxygen, Feb., p. 25
Diverse industries consume over 50 billion cu ft of high-purity oxygen yearly, Feb., p. 32
Don't overlook standard shapes in your design, Sept., p. 45
Draw and shrink strains, how to evaluate them, Apr., p. 50
Drill press casting is welded, Oct., p. 58

E

Economical oxygen distribution, storage is a must as demands soar, Feb., p. 28
Editorials — This (and every) year's task, Jan., p. 29; Will we open the door?, Feb., p. 23; Uncle Sam deserves a pay cut, Mar., p. 23; Too many cooks, Apr., p. 41; Too many too often, May, p. 41; Sharper focus, June, p. 35; Our noble heritage, July, p. 33; Notable converts, Aug., p. 33; Don't be afraid to lose, Sept., p. 37; Another race to run, Oct., p. 35; A degree of discontent, Nov., p. 39.
Eighteen percent nickel steel has high ductility, May, p. 85
Eight hundred specialists speak at safety congress, Dec., p. 55
Electrodes produced at higher rate, Dec., p. 62
Electronic controls offer several advantages, June, p. 40
Electroslag welders speed caisson production, Oct., p. 66
Engineering Data Sheets — No. 245: Processes of welding, Jan., p. 71; No. 246: Oxygen cylinder data, Feb., p. 43; No. 247: Determining deposited weld metal, Mar., p. 51; No. 248: Determining weld area, length, Apr., p. 53; No. 249: NEMA standard for covered electrode identification, May, p. 69; No. 250: Computing fillet weld stress, June, p. 63; No. 251: Stainless steel specifications, July, p. 57; No. 252: Industrial gas data, Aug., p. 39; No. 253: Determining efficient fillet welds, Sept., p. 49; No. 254: Estimating electrode consumption, Oct., p. 77; No. 255: Computing stress in fillet welds, Nov., p. 79.
Expressway beams are flame cleaned, Feb., p. 59
Eye shielding, how to select it, Oct., p. 39

F

Fabrication of nuclear piping demands revised welding procedures, Mar., p. 25
Farm welding brings profit, Mar., p. 46
Fiber metal brazing surmounts wide gaps and poor fit-ups, Mar., p. 28
Fiber metallurgy promises greater efficiency in resistance welding, Mar., p. 27
Fifteen ways to reduce short span steel bridge costs, July, p. 42
Fifty eighty-three aluminum alloy bids for cryogenic market, July, p. 38
Film shows how to weld T-1, July, p. 46
Flame cleaning is used on expressway beams, Feb., p. 59
Flame cutter is tape controlled, Aug., p. 62
Flame-straightening restores fire distorted steel, May, p. 80
Flash butt welding produces saw blades, Apr., p. 80
Flux-cored process makes 5-ft pass in 80 seconds, Apr., p. 96
Fluxless solder cuts aluminum window costs, Feb., p. 53
Ford Motor Co. saves cash by repair-welding, Mar., p. 34
Forty-five years of welding, Jan., p. 31
Friction welder fills an order, Aug., p. 58
Friction welding studied by American laboratory, Jan., p. 39
Fuel gases for oxygen cutting Dec., p. 37
Fumes, how to guard against them, Oct., p. 37
Future possibilities for welding, Jan., p. 52

G

Galvanized steel tests for spot welding standards, Sept., p. 42
Gases, fuel, for oxygen cutting, Dec., p. 37
Gases, shielding, Aug., p. 35
Gas line joined by automatic Mig welding, May, p. 54
Generating station built with aid of welding, Mar., p. 56
Giant radio-telescope will tune-in outer space, July, p. 35
Giant steel "cans" line hydroelectric power tunnels, July, p. 48
Glossary of brazing terms, Jan., p. 45
Gloves for welding, Oct., p. 42

H

Hand protection for the weldor, Oct., p. 42
Hardfacing adds life to control valves, Oct., p. 78
Hardfacing alloys, how to deposit them, July, p. 40
Hardfacing, procedures for analyzing the job, May, p. 70
Hardfacing rebuilds spray gun tips, Mar., p. 37
Health hazards from ultrasonic welding, Oct., p. 50
Health hazard from welding fumes, Oct., p. 37
Heating, air conditioning show draws 25,000, Apr., p. 92
High-purity oxygen is consumed at 50 billion cu ft per year rate, Feb., p. 32
History of welding in the past 45 years, Jan., p. 31
Hopper cars are welded with CO_2 flux core process, Aug., p. 42
How temperatures are measured, Jan., p. 40
How to deposit hardfacing alloys, July, p. 40
How to evaluate fuel gases for oxygen cutting, Dec., p. 37
How to evaluate shrink and draw strains, Apr., p. 50
How to get the most from your resistance welder, Jan., p. 42
How to guard against welding fumes, Oct., p. 37
How to select and use proper welding power sources, Jan., p. 35
How to select proper eye shielding, Oct., p. 39
How to weld austenitic stainless steel, Nov., p. 66
HY-80 steel is studied in ship building, Apr., p. 75

I

Illinois, Oklahoma schools increase welding classes, Aug. ,p. 61
Impact-spot method can reduce machine weight, Nov., p. 46
Inert gas shielding, Aug., p. 35
Inspectors, welding, what is their job?, Jan., p. 47
Instruction aided by television, Apr., p. 86
International Trade Fair held in Chicago, Oct., p. 64
It's position that counts!, June, p. 37

J

Jet planes to be refueled from welded pipeline, Sept., p. 50
Jigs are used to fabricate railroad hopper cars, Aug., p. 42
Joining ultra-thin materials to thick ones with resistance welding, June, p. 54
Joints are brazed simultaneously on chemical reactor, July, p. 60

L

Largest tank cars in world are all-welded, Jan., p. 78
Lead-lined pools are welded, Feb., p. 63
Liquid oxygen lines are Tig welded, Feb., p. 48
Low cost sandwich panels, May, p. 63
Liquid fuel pipe is Tig welded, Dec., p. 46

M

Magnetic particles, penetrants used for inspection, June, p. 44
Maintaining your resistance welder, Jan., p. 42
Mammoth box grider supports crane runways, Sept., p. 74
Management as seen by a weldor, Apr., p. 54
Manual metal arc welding joins wire reinforcement, May, p. 52
Manual metal arc welding aids ship repair firm, July, p. 44
Manual metal arc welding forms TV tower, May, p. 46
Manual metal arc welding joins degassing tanks, Sept., p. 39
Manual metal arc welding joins fuel pipe at airport, Sept., p. 50
Manual metal arc welding produces giant riveters, Aug., p. 46
Measuring temperatures, Jan., p. 40
Metal Congress and Exposition to be held in Detroit, Oct., p. 54
Metallurgy, fiber, and resistance welding, Mar., p. 27
Metallurgy survey shows problems encountered in fabrication, Jan., p. 72
Metal uses, welding techniques covered at AWS fall meeting, Nov., p. 56
Mig and Tig welding, how to use them, Aug., p. 40
Mig cuts field pipe welding time, Apr., p. 66
Mig plus 5086 aluminum equals lightweight boats, Sept., p. 70
Mig spot welding speeds auto production, May, p. 64
Mig welder joins aluminum gas line, May, p. 54
Mig welding, fully automatic, may replace pipeline weldors, June, p. 47
Mig welding, semiautomatic, aids plastic industry, Apr., p. 58
Mig welding, square-butt, joins aluminum cylinders, Jan., p. 75
Miles of CO_2-shielded welds fabricate railroad hopper cars, Aug., p. 42
Miles of Mig welds for radar platforms, Oct., p. 69
Miniature core diodes are welded, May, p. 43
Missile's aluminum fuel tanks are being Tig welded, Mar., p. 48
Missile site doors are welded, May, p. 48
Mobile units cut welding time at weapons plant, Apr., p. 85
Modernized electrode plant draws wire at 1,200 fpm rate, Dec., p. 62

N

Navy welding school takes its first steps into the nuclear age, Mar., p. 32
New film shows how to weld T-1, July, p. 46
New weldable 18% nickel steel has high ductility, May, p. 85
New York becomes world's welding capital, Apr., p. 43
Nickel-silver brazing solves stapling machine production problems, Apr., p. 88
Nickel steels, aluminum compete for growing cryogenic market, Feb., p. 38
Nineteen-sixty . . . A record-setter marred by RW and electrode losses, Mid-June p. 17
Nine percent nickel steel used in cryogenics, Apr., p. 46.
Nondestructive testing used on space tower welds, Nov., p. 74
Now — one welder for six semiautomatic processes, June, p. 50
Nuclear age calls for new navy welding methods, Mar., p. 32
Nuclear piping fabrication demands revised welding procedures, Mar., p. 25
Nuclear ship gets welded demineralizer, June, p. 60

O

Old standby — A-7 steel — used in all-welded building frame, May, p. 50
One hundred and ninety-two joints brazed simultaneously to chemical reactor, July, p. 60
One man makes 10,000 stud welds in a week, Dec., p. 67
One thousand two hundred and eighty tons of blast-proof doors for missile site!, May, p. 48
Open letter to management, Apr., p. 54
Overhead welding used to advantage in pipe forming, Nov., p. 52
Oxyacetylene flame sprays, fuses powdered metals, Feb., p. 60
Oxyacetylene torch process restores distorted steel, May, p. 80
Oxygen cutting fuel gases, Dec., p. 37
Oxygen distribution economy, storage a must as demands soar, Feb., p. 28
Oxygen, high purity, is consumed at 50-billion-cu-ft annual rate, Feb., p. 32
Oxygen . . . its production . . . distribution . . . and uses, Feb., p. 25
Oxygen line fabrication costs cut 50% by Tig welding, Feb., p. 48
Oxygen-powdered process, powder-lancing, cuts thick concrete, Feb., p. 45
Oxygen-pressure reducing regulators and what you should know about them, Feb., p. 34
Oxygen producers and suppliers, a complete list, Feb., p. 31
Oxygen producers meet rising demands with new plants, expanded facilities, Feb., p. 30
Oxygen, safe handling procedures, Feb., p. 27

P

Percussive welding of thin materials, Apr., p. 48
Pipe fabrication time cut by Mig, Apr., p. 66
Piping in hospital is Tig welded, Nov., p. 62
Piping, nuclear, demands revised welding procedures, Mar., p. 25
Pipeline of columbium-steel is weldable, economical, strong, Nov., p. 58
Piping, small diameter, should be brazed, Jan., p. 44
Pipeline weldors vs. push-button welders, June, p. 46
Plant Maintenance Show draws thousands, Mar., p. 42
Plastics industry aided by Tig, Mig welding, Apr., p. 58
Pools, lead, are welded, Feb., p. 63
Positioners speed equipment fabrication, Mar., p. 38
Positioning and electronic controls, June, p. 40
Positioning can save you time and cash, June, p. 37
Powdered metals sprayed, fused by oxyacetylene flame, Feb., p. 60
Powder-lancing cuts 18-in. concrete doorways, Feb., p. 45
Power sources for welding, how to select them, Jan., p. 35
Power sources, their characteristics, Jan., p. 36
Power tunnels are lined with steel cans, July, p. 48
Predictions for welding's future, Jan., p. 52
Procedures for analyzing hardfacing jobs, May, p. 70
Production line practices speed heavy equipment fabrication, Mar., p. 38
Proper welding saves thousands of dollars for Ford Motor Co., Mar., p. 34
Protecting the eyes while welding, Oct., p. 39

Q

Qualifications a welding inspector should have, Jan., p. 47
Quality welding and the need for proper codes, Oct., p. 46
Quenched and tempered low alloy steel is used in ship building, Apr., p. 75

R

Radar platforms are Mig welded, Oct., p. 69
Radiant heating element is welded wire, May, p. 52
Radio-telescope will tune-in outer space, July, p. 35
Railroad car linings installed faster with welded studs, July, p. 50
Railroad cars are produced faster with CO_2-Mig welding, Oct., p. 61
Rail steel can be welded easily, Nov., p. 48
Reactive metal tubing is Tig welded on a production basis, Apr., p. 60
Rebuilt spray gun tips last 480 times longer, Mar., p. 37
Record setting welding year marred by RW and electrode losses, Mid-June, p. 17
Regulators, oxygen, what you should know about them, Feb., p. 34
Repair welding saves drill press casting, Oct., p. 58
Resistance seam welding, Tig produce space capsule, Sept., p. 59
Resistance spot welds complete solar mirror, Dec., p. 58
Resistance welder has 150-in. reach, Apr., p. 94
Resistance welder joins ultra-thin materials to thick ones, June, p. 54
Resistance welders can weigh less with impact-spot method, Nov., p. 46
Resistance welders, how to get the most from them, Jan., p. 42
Resistance welder with vapor-cooled transformer speeds tube production, Aug., p. 55
Resistance welding of fiber metals, Mar., p. 27
Revolving Tig unit cuts costs, but maintains quality, Aug., p. 44
Riviters are produced with manual metal arc welding., p. 46
Roll welding joins sandwich panels, May, p. 63
Runway girders are submerged-arc welded, Aug., p. 56
Russians study friction welding, Jan., p. 39
Russian welding: progress and goals, Dec., p. 48
Ryan utilizes thin-skin welds to complete solar mirror, Dec., p. 58

S

Safe handling procedures for cylinders and oxygen, Feb., p. 27
Safety congress draws 800 specialists, Dec., p. 55
Safety tips to follow, Oct., p. 75
Salvaging equipment at Ford Motor Co., Mar., p. 34
Sandwich panels joined by roll welding, May, p. 63
Saw blade joints flash butt welded, Apr., p. 80
School for navy welding prepares for nuclear age, Mar., p. 32
Schools increase welding classes, Aug., p. 61
Semi-automatic vapor-shielded arc process cuts welding time, Feb., p. 54
Semi-automatic welder handles six processes, June, p. 50
Seven welded buildings win design awards, Oct., p. 62
Shielding for the eyes, how to select it, Oct., p. 39
Shielding gases and their function in the welding arc, Aug., p. 35
Ship repair firm leans heavily on welding, July, p. 44
Should you switch to automatic arc welding?, June, p. 41
Shrink and draw strains, how to evaluate them, Apr., p. 50
Solar mirror completed with thin-skin welds, Dec., p. 58
Simple and effective safety tips to follow, Oct., p. 75
Small welded karts provide new sport, Mar., p. 62
Space age requirements spur resistance welding innovation, June, p. 54
Space capsule — how it was welded, Sept., p. 59
Space tower's welds get X-ray inspection, Nov., p. 74
Speed auto-body production by 40% May, p. 64
"Split" barges are built with help of submerged arc-weldng, Jan., p. 66
Spot welder arms can weigh less with impact method, Nov., p. 46
Spot welder reaches as far as 150 in. to make blind welds, Apr., p. 94
Spot welding tests for galvanized steel, Sept., p. 42
Sprayed overlay cuts motor drive shaft production costs, Apr., p. 69
Spray gun tips rebuilt by hardfacing, Mar., p. 37
Square-butt Mig welding joins aluminum cylinders, Jan., p. 75
Stainless steel, austenitic, how to weld it, Nov., p. 68
Standard shapes in designing, Sept., p. 45
Stapling machines are nickel-silver brazed, Apr., p. 88
Steel bridge costs can be reduced, July, p. 42
Steel cans line hydroelectric power tunnels, July, p. 48
Steel containers used by army are welded, Jan., p. 48
Steel from railroad track can be easily welded, Nov., p. 48
Steel island is $30 million sulphur mine, Mar., p. 30

Steelmaker fabricates vacuum degassing tanks, Sept., p. 39
Steel pipe forms chapel spires, Apr., p. 56
Steel tubing uses grow due to appearance and strength, Nov., p. 42
Steel with columbium additive offers advantages in pipeline construction, Nov., p. 58
Storing and distributing oxygen, Feb., p. 28
Studs, welded, speed bridge conversion, Mar., p. 52
Stud welding system joins thin metals without distortion, Apr., p. 49
Stud welds used to make flume liners, Dec., p. 67
Submerged arc, manual metal arc weld steel frame, May, p. 50
Submerged arc, Mig, manual metal arc used on radio-telescope, July, p. 35
Submerged-arc welding forms runway girders, Aug., p. 56
Submerged-arc welding helps build "split" barges, Jan., p. 66
Submerged arc welding produces box girders, Sept., p. 74
Submerged arc welds blast-proof doors, May, p. 48
Sulphur mine is welded steel island, Mar., p. 30
Super vacuum causes metal evaporation, cold welding, Nov., p. 41
Survey of notch tough steels shows fabrication problems, Apr., p. 75
Survey of welding metallurgy shows problems and solutions encountered in fabrication, Jan., p. 72

T

Tank cars, welded, are world's largest, Jan., p. 78
Tape-controlled flame cutter makes debut, Aug., p. 62
Television aids welding instruction, Apr., p. 86
Television tower is manual arc welded, May, p. 46
Temperatures, how they are measured, Jan., p. 40
Tests prove 9% nickel steel meets requirements for cryogenic service, Apr., p. 46
The shielding gases . . . their function in the welding arc, Aug., p. 35
Thin metals are resistance welded to thick metals, June, p. 54
Thin-metals percussive welded without marring or distortion, Apr., p. 48
Thin-skin welds complete solar mirror, Dec., p. 58
Three hundred weldors help to build new generating station, Mar., p. 56
Three miles of runway girders are submerged-arc welded, Aug., p. 56
Tig and Mig, how to use them, Aug., p. 40
Tig, resistance seam welding produce space capsule, Sept., p. 59
Tig, submerged-arc build steel island, Mar., p. 30
Tig unit cuts aluminum tube welding costs, Aug., p. 44
Tig welded aluminum eye makes big pull, Apr., p. 98
Tig welded copper piping provides heating, ventilation for Missouri hospital, Nov., p. 62
Tig welded pipe curbs high liquid fuel waste, Dec., p. 46
Tig welding is used to fabricate missile fuel tanks, Mar., p. 48
Tig welding cuts costs 50% in oxygen line fabrication, Feb., p. 48
Tig welding a nuclear ship demineralizer, June, p. 60
Tig welding reactive metal tubing, Apr., p. 60
Tig welding upside-down maintains pipe contours, Nov., p. 52
T-1, film shows how to weld it, July, p. 46
Trade Fair is held in Chicago, Oct., p. 64
Trucks out, welded pipe in for Chicago plane refueling, Sept., p. 50
Tube welding is faster with vapor-cooled transformer, Aug., p. 55
Tubing is joined by friction welding, Aug., p. 58
Tubing of reactive metal is Tig welded on a production basis, Apr., p. 60
Tubing uses grow due to appearance and strength, Nov., p. 42

U

Ultrasonic waves can be a hazard, Oct., p. 50
Ultrasonic welding symposium sponsored by Air Force, Sept., p. 76
Ultra-thin materials joined to thick ones with resistance welding, June, p. 54
Upside-down Tig welding maintains uniform pipe contours, Nov., p. 52
U.S. space capsule — how it is welded, Sept., p. 59

V

Vacuum causes metal evaporation, cold welding, Nov., p. 41
Vacuum degassing tanks fabricated by steelmaker, Sept., p. 39
Vapor-cooled transformer speeds pipe, tube welding, Aug., p. 55
Vapor shielding process cuts welding time, Feb., p. 54

W

Water cooling systems, which one is best for you?, Sept., p. 60
WE celebrates 45th anniversary with awards luncheon, June, p. 58
Welded bombs are "on target," Feb., p. 58
Welded joints, how to design them, Mid-June, p. 5
Welded saw blade joints must meet rigid specifications, Apr., p. 80
Welded studs help build railroad car linings, July, p. 50
Welded studs speed bridge conversion, Mar., p. 52
Welded tank cars are world's largest, Jan., p. 78
Welding aids plastics industry, Apr., p. 58
Welding austenitic stainless steel, Nov., p. 66
Welding, automatic, from transistors to massive forgings, June, p. 44
Welding engineer defends codes, Oct., p. 48
Welding, friction, studied by American laboratory, Jan., p. 38
Welding, from blacksmith era to space age, Jan., p. 31
Welding fumes . . . simple precautions will protect you from them, Oct., p. 37
Welding gloves, how to choose them, Oct., p. 42
Welding HY-80 steel, Apr., p. 75
Welding in Russia today, Dec., p. 48
Welding inspectors, what is their job? Jan., p. 47
Welding leaders look to the future, Jan., p. 52
Welding metallurgy survey shows fabrication problems, Jan., p. 72
Welding on the farm, Mar., p. 46
Welding power sources, how to select them, Jan., p. 35
Welding procedures must be developed for nuclear piping, Mar., p. 25
Weldment-casting design improves riveters, Aug., p. 46
Weld-wax — a new method joins diodes, May, p. 43
WE visits Chicago's International Trade Fair, Oct., p. 64
WE visits the Plant Maintenance Show, Mar., p. 42
What is the welding inspector's job?, Jan., p. 47
Which water cooling system best suits your particular needs?, Sept., p. 60
Why you should braze small diameter piping, Jan., p. 44
What you should know about oxygen pressure reducing regulators, Feb., p. 34
Will Mig and Tig meet your needs?, Aug., p. 40
Will push-button welding replace pipeline weldors?, June, p. 46
Wire fabric finds new markets, May., p. 52
World's tallest structure . . . design said "weld it", May, p. 46

X

X-ray inspection is used on giant steel cans, July, p. 48
X-ray inspection is used on space tower welds, Nov., p. 74
X-ray inspection is used on welded pipeline, Sept., p. 49
X-ray inspection is used to inspect Tig welded oxygen line, Feb., p. 48

Y

You can be a coathanger sculptor, Mar., p. 58

Z

Zinc group sponors tests to set spot welding standards for galvanized steel, Sept., p. 42

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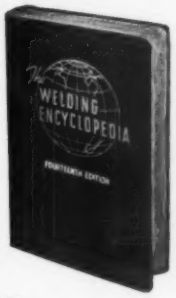

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SHIELDING GAS—Air Reduction Sales Co. ADR 135 is illustrated article on how to choose the proper shielding gas for Mig and Tig operations.
Circle No. 86 on Info-Aid Card.

WELDING POSITIONERS—Aronson Machine Co., Inc. Bulletin HTS 960 is a 1-page illustrated brochure giving data and features of 2,500-lb to 160,000-lb-capacity welding positioners.
Circle No. 87 on Info-Aid Card.

PLASMA SPRAYING — Precise Metal Products Corp. Four-page brochure includes photographs and explanation of plasma spraying and generating.
Circle No. 88 on Info-Aid Card.

CUTTING, GRINDING WHEEL — Bay State Abrasive Products Co. Colorful illustrated sheet, Form 34, tells about reinforced resinoid disc-wheel for grinding, cutting and blending.
Circle No. 89 on Info-Aid Card.

VAPOR-SHIELDED WELDING—The Lincoln Electric Co. Vapor-shielded welding and new open-arc welding process are illustrated and explained in 12-page bulletin, No. 5300.1.
Circle No. 90 on Info-Aid Card.

X-RAY FILMS—The Gevaert Co. of America, Inc. Industrial X-ray film book No. 210.991 contains 25 illustrated pages of technical data on films including chart of suggested exposure times for various metals.
Circle No. 91 on Info-Aid Card.

AIR TORCHES — Acetylene Supply Co. Illustrated catalog contains information on atmospheric air torches which can be used with acetylene and propane. Catalog also includes tips and heating, soldering and brazing accessories.
Circle No. 92 on Info-Aid Card.

REVERSIBLE WELDOR'S GLOVE—Singer Glove Mfg. Co. Sheet has color drawing of reversible weldor's glove and gives information on its construction and uses.
Circle No. 93 on Info-Aid Card.

TIG WELDER — Emerson Electric. Illustrated sheet X9796 includes photo of and information on 295-amp Tig welder including list of features and input-output information.
Circle No. 94 on Info-Aid Card.

HARDFACING ELECTRODES—Haynes Stellite Co. Hardfacing electrodes are listed and discussed with application procedures, forms, problems and typical application in this illustrated 8-page booklet F 30087-C.
Circle No. 95 on Info-Aid Card.

BRAZING STAINLESS STEEL—Handy & Harman. Stainless steel brazing is illustrated in various applications in this 4-page issue of Brazing News No. 85.
Circle No. 96 on Info-Aid Card.

WELDING, CUTTING TORCHES — Chicago Tool and Engineering Co. Circular 555 shows, discusses and explains arc-oxygen and free air cutting and welding torches and accessory equipment.
Circle No. 97 on Info-Aid Card.

WELDING WIRE—All-State Welding Alloys Co., Inc. Form No. 5261 is 6-page bulletin describing copper and copper-based welding wire for Mig and Tig welding. Procedures, selection chart, data sheets are included.
Circle No. 98 on Info-Aid Card.

FIRE SAFETY — Walter Kidde & Co., Brochure P-67 is 12-page booklet illustrating and describing full line of portable fire extinguishers, smoke and fire detectors and built-in carbon dioxide systems..
Circle No. 99 on Info-Aid Card.

A-C ARC WELDERS—Birdsell Products. Bulletin 190-1 describes portable a-c arc welders with welding range from 10 to 190 amp for use on 110/220-volt lines.
Circle No. 100 on Info-Aid Card.

COPPER PANEL GRIDS — Anaconda American Brass Co. Suggested layout and installation procedures for copper tube panel grids are included in this illustrated 28-page booklet. Grids are used for radiant panel heating.
Circle No. 101 on Info-Aid Card.

WELDING ACCESSORIES—Hobart Bros. Co. Form EW-211 is fully-illustrated 18-page booklet covering welding accessories including headshields, lenses, hard hats, goggles, cleaning tools, electrode holders, ground clamps, connectors, clamps, plugs, welding cable, protective clothing, gloves, and other items.
Circle No. 102 on Info-Aid Card.

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WELDING info-aids

To receive literature, catalogs and bulletins described on this page, and the preceding and following pages; for more information on products or services advertised in this issue; and for more information about

NEW PRODUCTS on pages 18-31

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Advertisers' Literature

Literature offered in advertisements which were received up to the 5th of last month. To get the literature you want circle numbers on fold-out card at right.

187. All-State Welding Alloys Co., Inc. — Folder on "Jet Flux" and instruction manual and catalog available.

150. American Platinum & Silver Div. — Booklet available "A Complete Guide to Successful Silver Brazing."

199. Anti-Borax Compound Co., Inc. — Sample and descriptive booklet on "Royal" hardening powder manufactured by Anti-Borax is available.

193. Aronson Machine Co., Inc. — Detailed engineering data on Aronson positioners available.

153. The Bastian Blessing Co. — Catalog No. G300-GA available on the "Rego" 600 series cylinder valves.

198. Becker Brothers Carbon Co. — Catalog available on Becker welding electrodes, carbon and graphite and other materials used in welding.

158. Bernard Welding Equipment Co. —Connector Bulletin No. 102 further explains "hammer-on" cable connectors, lugs and splicers; gives sizes and prices.

172. Bernard Welding Equipment Co. — Pamphlet available, "The use of Water Cooling for Welding Equipment."

201. Columbia Electric Mfg. Co. — Catalog WE-400 is available on the Tong-Test Ammeter to get the exact amperage for your welding job.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182
183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238
239	240	241	242	243	244	245	246	247	248	249	250		

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1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182
183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238
239	240	241	242	243	244	245	246	247	248	249	250		

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ADVERTISERS IN THIS ISSU

This advertisers' index is included as a convenience and is in a part of the advertising contract. Although every care has be to index accurately, some errors may have occurred and no a will be made for them.

A

Air Reduction Chemical & Carbide Co. 76
Air Reduction Sales Co. 16
Alloy Rods Co. 49
All-State Welding Alloys Co. 68
American Platinum & Silver Div. Engelhard Industries, Inc. ..... Inside Front Cover
Anti-Borax Compound Co., Inc. 80
The Arcair Co. 20
Arcos Corp. 74, 75
Aronson Machine Co. 77

B

Bastian Blessing Co. 4
Bay State Abrasive Products Co. 56, 57
Becker Brothers Carbon Co. 79
Belden Mfg Co. 10
Bernard Welding Equipment Co. 13, 30

C

Chemetron Corp., National Cylinder Gas Div. 24, 25
Chicago Hardware Foundry Co. 80
Coast Metals Inc. 12
Columbia Electric Mfg. Co. 80
Contour Sales Corp. 66
Coyne Cylinder Co., Div. of American Cryogenic, Inc. 50

D

Dockson Corp. 73
Duro Engineering Co. 67

E

Eastman Kodak Co. 47
Eisler Engineering Co. 80
Engelhard Industries, Inc. American Platinum & Silver Div. ..... Inside Front Cover
Engwald Corp. 78

G

Gevaert Co. of America Inc. 19

H

H & M Pipe Beveling Machine Co. 28
Harnischfeger Corp. 60, 61
Harrisburg Steel Co. 36
Harris Calorific Co. 32
Hobart Brothers Co. 1, 2

J

Jackson Products, Div. o Air Reduction Co., Inc

L

Lenco, Inc. .....
Lincoln Electric Co. .....
Linde Co., Div. of Union Carbide Corp. 14, 27, 29, 31, 58, 5
Liquid Carbonic Div. .....

M

Markal Co. .....
Metalloy Products Co. .....
Miller Electric Mfg. Co. ..... 34, Ba
Modern Engineering Co. 6

N

National Cylinder Gas, Div. of Chemetron Co
National Standard Co. .....
Norton Co. .....

O

Oxo Welding Equipmen

P

Phelps Dodge Copper Products Corp. .....
Picker X-Ray Corp. .....
Pressed Steel Tank Co.

R

Robvon Backing Ring C
Ruemelin Mfg. Co. .....

S

Servospeed Division, Electro Devices, Inc.
Shawinigan Products C

T

Tempil Corp. .....
Thermice Corp. .....
Tod-O Mfg. Co. .....
Tweco Products, Inc. ..... Inside F

V

Victor Equipment Co.

W

Wallace Supplies Mfg.
Webb Corp., The .....
Welding Engineer .....
Western Enterprises I

SUE

d is in no way
as been taken
no allowance

Div. of
o., Inc. 9

..... 78
. 51-54

Corp.
, 58, 59, 70, 71
iv. 82

..... 22
Co. 82
g.
34, Back Cover
ing
..... 63, 64, 65

r Gas,
ron Corp. 24, 25
d Co. 33
..... 5

uipment Co. ..81

pper
. 23
rp. 81
nk Co. 21

Ring Co. 72
Co. 82

sion,
s, Inc. 62
ducts Corp. 22

T
..... 20
..... 71
..... 30
Inc.
nside Back Cover
V
nt Co. 6
W
es Mfg. Co. 78, 79
he 26
er 81, 83, 87
rises Inc. 76

190. **Dockson Corp.** — Safety catalog available including additional information on Dockson goggles.

196. **Engwald Corp.** — Descriptive catalog on Engwald exhaust systems available.

171. **H&M Pipe Beveling Machine Co.** — Catalog sheets and price lists on H&M's complete line of machines and accessories for pipe fabrication.

197. **Lenco Inc.** — Write for chart showing symbols for arc, gas and resistance welding.

166. **Markal Co.** — Literature available on "Thermomelt" temperature indicators and sample pellet.

176. **Miller Electric Mfg. Co.** — Descriptive literature on the Miller Gold Star SR or SRH welder and pamphlet, "Rectifiers for Welding"

168. **National Cylinder Gas, Div. of** Chemetron Corp. — Catalog N-177-E-2N available on the proper kind of protection for your welding, brazing and cutting jobs.

204. **Oxo Welding Equipment Co.** — Catalog on Adjustable Pipe Dollies available.

164. **Pressed Steel Tank Co.** — Cylinder catalog available, "Hackney Compressed Gas Cylinders" describes and illustrates the wide variety of "Hackney" cylinders.

206. **Ruemelin Mfg. Co.** — Detailed information on Ruemelin fume collectors available.

192. **Western Enterprises, Inc.** — Catalog containing 200 fitting illustrations is available, also catalog supplement 61-2.

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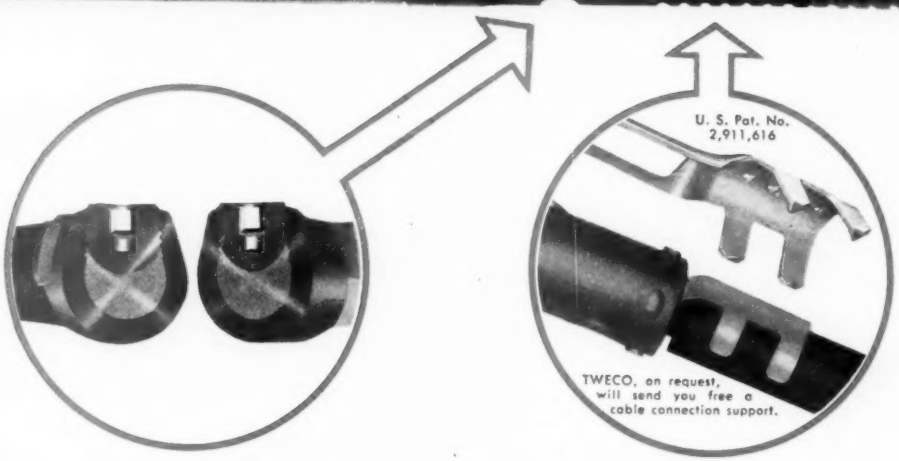

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